HARGIS + ASSOCIATES, INC.

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APPENDIX B

DATA QUALITY OBJECTIVES

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APPENDIX B

DATA QUALITY OBJECTIVES

PRE-DESIGN INVESTIGATION WORK PLAN

NORTHERN EXTRACTION AND CENTRAL EXTRACTION AREAS

OPERABLE UNIT 2

OMEGA CHEMICAL CORPORATION SUPERFUND SITE

LOS ANGELES COUNTY, CALIFORNIA

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LIST OF ACRONYMS/ABBREVIATIONS/COMMON TERMS

2010 FS	August 2010 OU2 Feasibility Study
2010 RI	August 2010 OU2 Remedial Investigation
2011 ROD	OU2 Interim Action Record of Decision, dated September 20, 2011
2016 CD	Consent Decree lodged April 20, 2016 covering Operable Unit 2 at the Omega Chemical Corporation Superfund Site
AOP	Advanced oxidation process
bgs	Below ground surface
CDM Smith	CDM Smith, Inc.
CDWR	California Department of Water Resources
CE Area	Central extraction area (The location of the CE area is depicted in the 2016 CD, Appendix C as the area between the NE and Telegraph Road.)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual Site Model
COCs	Chemicals of Concern
COPCs	Chemicals of Potential Concern
Day	Day means a calendar day unless expressly stated to be a working day. A working day is a day other than a Saturday, Sunday or federal or state holiday.
DDW	State Water Resources Control Board Division of Drinking Water
de maximis	de maximis, inc.
DLR	Detection limit for purposes of reporting
DQOs	Data Quality Objectives
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency

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LIST OF ACRONYMS/ABBREVIATIONS/COMMON TERMS (continued)

ESD	Explanation of Significant Differences
FSP	Field Sampling Plan
GAC	Granular activated carbon
Geosyntec	Geosyntec Consultants
gpm	Gallons per minute
H+A	Hargis + Associates, Inc.
HHRA	Human Health Risk Assessment
ICIAP	Institutional Controls Implementation and Assurance Plan
ICs	Institutional Controls. (ICs are non-engineering controls that will supplement engineering controls to prevent or limit potential exposure to hazardous substances, pollutants, or contaminants at the Site related to the Work and to ensure that the portion of the ROD applicable to the Work is effective.)
IX	Ion exchange
Key Treatment Constituents	Treatment constituents that may require treatment to meet discharge requirements associated with end-use (reinjection, spreading basin, reclaim). The Key Treatment Constituents are considered during the RD based on end use.
LE Area	Leading Edge Area of OU2 is the area in the 2016 CD, Appendix C that is south of the CE Area
Main COCs	13 COCs identified in the ROD as "main COCs" and listed in Table X. Includes eleven VOCs, 1,4-dioxane, and hexavalent chromium. The Main COCs are included in the COC list for the RD.
MCLs	Maximum Contaminant Levels (EPA and California)
MDL	Method Detection Limit
msl	Mean sea level

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LIST OF ACRONYMS/ABBREVIATIONS/COMMON TERMS (continued)

NE Area	Northern extraction area (The location of the NE area is depicted in Appendix C of the 2016 CD as an area north of the CE)
NE/CE Area	A portion of the area of the groundwater contamination identified by EPA as OU2 in its 2011 ROD. The NE/CE Area is bounded by the OU2 boundary as depicted in the 2016 CD, Appendix C and the area north of Telegraph Road. It includes the NE and CE areas as depicted in the ROD as well as the northern portion of the LE area as depicted in the ROD.
NF	Nanofiltration
NL	Notification Level, California State Water Resources Control Board
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OFRP	Oil Field Reclamation Project
Omega	Omega Chemical Corporation
Omega Property	The property formally owned by the Omega Chemical Corporation, encompassing approximately one acre, located at 12504 and 12512 East Whittier Blvd, Whittier, California. OU1 and OU3 are addressing soil, groundwater, and soil vapor source control at the Omega Property.
OU	Operable Unit, a discrete action that comprises an incremental step in the remediation of a contaminated site.
OU2	Operable Unit 2, the contamination in groundwater generally downgradient of Omega Property, much of which has commingled with chemicals released at other locations into a regional plume containing multiple contaminants which, when considered in total, is more than four miles long and one mile wide. The OU2 boundary is depicted in the 2016 CD, Appendix C.
PC	Project Coordinator, an individual who represents the SWDs and is responsible for overall coordination of the Work.

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LIST OF ACRONYMS/ABBREVIATIONS/COMMON TERMS (continued)

PDI	Pre-Design Investigation
PDIWP	Pre-Design Investigation Work Plan
Performance Standards	The cleanup levels and other measures of achievement of the remedial action objectives, as set forth in the SOW, Paragraph 1.3(c).
PRPs	Potentially Responsible Parties
PS	Problem Statement
QAPP	Quality Assurance Project Plan
RA	Remedial Action (Remedial Action shall mean all activities Settling Defendants are required to perform under the 2016 CD to implement the 2011 ROD, in accordance with the SOW, the final approved RD submission, the approved RA Work Plan and other plans approved by EPA, including the ICIAP, until the Performance Standards are met, and excluding performance of the RD, O&M, and the activities required under the Retention of Records section of the 2016 CD.)
RAOs	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design (Remedial Design means those activities to be undertaken by Settling Work Defendants to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design Work Plan.)
RDWA	Remedial Design Work Area. (The RDWA consists of the NE/CE Area and includes potential treated water end use locations that may be adjacent to or outside of OU2.)
RDWP	Remedial Design Work Plan
RO	Reverse osmosis
RWQCB-LA	Regional Water Quality Control Board, Los Angeles Region

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LIST OF ACRONYMS/ABBREVIATIONS/COMMON TERMS (continued)

Site	Omega Chemical Corporation Superfund Site, originally listed on the National Priorities List on January 19, 1999, which is located in Los Angeles County, California, and includes the contamination being addressed by multiple Operable Units.
SOPs	Standard operating procedures
SOW	Statement of Work, Appendix B to the 2016 CD.
STLC	Soluble threshold limit concentration
Supervising Contractor	The entity selected by SWDs to oversee field work.
SVOCs	Semivolatile organic compounds
SWDs	Settling Work Defendants, as identified in Appendix E to the 2016 CD. SWDs include the McKesson Corporation and OPOG (Omega Chemical Corporation Superfund Site Potentially Responsible Party Organized Group).
TC	Toxicity characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total dissolved solids
TPH	Total petroleum hydrocarbons
TTLC	Total threshold limit concentration
ug/l	Micrograms per liter
UGSG	United States Geological Survey
USC	United States Code
VOCs	Volatile organic compounds
WAMP	Work Area Monitoring Plan

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LIST OF ACRONYMS/ABBREVIATIONS/COMMON TERMS (continued)

Waste Material	Shall mean (1) any “hazardous substance” under Section 101(14) of CERCLA, 42 U.S.C. § 9601(14); (2) any pollutant or contaminant under Section 101(33), 42 U.S.C. § 9601(33); (3) any “solid waste” under Section 1004(27) of RCRA, 42 U.S.C. § 6903(27); or as any of the foregoing terms are defined under any appropriate or applicable provisions of California law.
WDR	Waste Discharge Requirements
WET	California Waste Extraction Test
Work	All activities and obligations the SWDs are required to perform under the 2016 CD, except the activities required under the Retention of Records section of the 2016 CD.
Work Area	The portions of OU2 that are the subject of Work under the 2016 CD and the SOW.

LIST OF ADDITIONAL ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
1,1,2-TCA	1,1,2-Trichloroethane
1,2-DCA	1,2-Dichloroethane
1,2,3-TCP	1,2,3-Trichloropropane
cis-1,2-DCE	cis-1,2-Dichloroethane
Freon 11	Trichlorofluoromethane
Freon 113	1,1,2-Trichloro-1,2,2-trifluorethane
NDMA	N-Nitrosodimethylamine
PCE	Tetrachloroethene, perchloroethene
TCE	Trichloroethene

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APPENDIX B
DATA QUALITY OBJECTIVES
PRE-DESIGN INVESTIGATION
NORTHERN EXTRACTION AND CENTRAL EXTRACTION AREAS
OPERABLE UNIT 2
OMEGA CHEMICAL CORPORATION SUPERFUND SITE
LOS ANGELES COUNTY, CALIFORNIA

1. INTRODUCTION

Data needs were identified and developed by addressing specific problem statements and project objectives through the Data Quality Objective (DQO) process. This Appendix utilizes United States Environmental Protection Agency (EPA) guidance to prepare DQOs for the Pre-Design Investigation (PDI) to support the design of the Northern Extraction (NE)/Central Extraction (CE) Area remedial action (RA) outlined in the Statement of Work (SOW), Appendix B of the Consent Decree (2016 CD) for Operable Unit 2 (OU2) at the Omega Chemical Corporation Superfund Site (EPA, 2016).

The main components of the NE/CE Area Work are extraction wellfields in the NE Area (in the vicinity of Sorensen Avenue) and the CE Area (in the vicinity of Telegraph Road); one or more treatment systems that will be determined by selected water end use; an end use of treated groundwater including one or more of the following: reinjection (shallow and/or deep), basin recharge, and reclamation; associated conveyance pipelines; and Institutional Controls (ICs). The Remedial Design Work Area (RDWA) consists of the NE/CE Area and includes potential treated water end use areas that may be adjacent to or outside of the NE/CE Area or OU2 (Figure B-1).

A data gaps analysis was conducted for the RDWA. The results of the data gaps analysis were used to develop Problem Statements outlined in this DQO document. The data gaps analysis is presented in Appendix A (H+A, 2016).

2. STATE THE OVERALL PROBLEM

The first step in any systematic planning process, and therefore the DQO process, is to define the problem that has initiated the study. As environmental problems are often complex combinations of technical, economic, social, and political issues, it is critical to the success of the process to separate each problem, define it completely, and express it in an uncomplicated format. A proven effective approach to formulating a problem and establishing a plan for obtaining information that is necessary to resolve the problem is to involve a team of experts and stakeholders that represent a diverse, multidisciplinary background.

2.1 <u>Background</u>

OU2 of the Omega Chemical Superfund Site addresses contamination in groundwater generally downgradient of the Omega Property, much of which has commingled with chemicals released at other locations into a regional plume containing multiple contaminants which, when considered in total, is more than four miles long and one mile wide. The 2011 Record of Decision (2011 ROD) addresses containment of OU2 groundwater contamination. The OU2 boundary, as defined in the 2011 ROD, is presented in Figure B-1. The Work covered by the SOW includes groundwater containment in the NE/CE Area as well as additional investigation in the LE Area. Source control at the former Omega Chemical Corporation facility in Whittier, California has been addressed under OU1 and OU3. Since 2001, the Omega Chemical Corporation Superfund Site Potentially Responsible Party Organized Group (OPOG) has led the investigation and remediation of the former Omega Property under OU1 and OU3 with EPA oversight. In addition to a 1995 removal action, source area remediation has also included groundwater and soil vapor extraction systems which began operating in 2009. McKesson Corporation has worked with California Department of Toxic Substances Control (DTSC) and has undertaken source control actions at its source property located on Sorensen Avenue. On December 7, 2015, the DTSC approved McKesson Soil Remedial Action Closure Report and determined the soil remediation portion of the project was complete. Other source properties contributing to groundwater contamination that has commingled with groundwater contamination from the Omega Property and the McKesson property have been addressed, are currently being addressed, or will be addressed by the DTSC or the Regional Water Quality Control Board, Los Angeles Region (RWQCB-LA) through investigations and source control actions. These activities are important for the future cleanup of the Site but are not part of the current SOW.

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The 2011 ROD identified 13 chemicals of concern (COCs) for OU2, eleven of which are VOCs (tetrachloroethene (PCE), trichloroethene (TCE), Freon 11, Freon 113, 1,1-dichloroethene [1,1-DCE],cis-1,2-dichloroethene [cis-1,2-DCE], chloroform, carbon tetrachloride, 1,1-dichloroethane [1,1-DCA], 1,2-DCA, and 1,1,2-trichloroethane [1,1,2-TCA]); one is an inorganic constituent (hexavalent chromium) and the remaining compound is 1,4-dioxane (Table B-1). These 13 COCs will be referred to as Main COCs in the RD documents and are included in the COCs for the purpose of the RD. Containment of the Main COCs should also contain other chemicals, including benzene, toluene and other fuel related compounds, identified in the 2010 RI as chemicals exceeding screening levels.

The 2011 ROD also identified treatment standards for different end uses, which included ten of the 13 Main COCs and an additional eight or nine constituents, depending on end use. For the purposes of the PDI, the additional constituents will be referred to as “Key Treatment Constituents” (Table B-1). The Key Treatment Constituents are considered during the RD based on end use, but are not included in the COC list. Based on the end use selected, extracted water will be treated for chemicals and constituents exceeding permit limits

2.2 <u>Conceptual Site Model</u>

There are numerous source sites for COCs that have reached both shallow and regional groundwater. Contaminated groundwater associated with these site sources is known to be present within the NE/CE Area from about the water table (approximately 40 to 100 feet below ground surface [bgs]) to about 200 feet bgs.

Groundwater within the RDWA generally flows southwest and south. The groundwater within the OU2 area is used as a source of drinking water by several municipal and private water purveyors (Figure B-2). Most of the drinking water wells located in the OU2 area draw water primarily from deeper portions of the aquifer at depths of 200 feet bgs or greater and are not currently impacted by groundwater contamination (CH2MHill, 2010). However, a few drinking water wells in the area draw water at about the 200 feet bgs level and have had some contaminants detected. These wells are currently equipped with treatment units which consist of granular activated carbon (GAC) filters. The GAC filter removes the VOCs from the water to ensure that it meets drinking water standards. Drinking water for the cities of Whittier, Santa Fe Springs, and Norwalk is tested regularly prior to distribution to the public, and, based on information EPA has been provided, all tap water meets State and Federal drinking water standards.

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The risk to ecological receptors from contaminants in OU2 groundwater is negligible due to the depth of groundwater (CH2MHill, 2010). All surface water drains are at substantially higher elevations than the water table at OU2; thus, groundwater does not discharge to surface water bodies where exposure of ecological receptors otherwise could occur.

2.3 Problem Statements

The issues/objectives to be addressed by the PDI were developed incorporating the above background information and conceptual site model (CSM), along with specific requirements outlined in the EPA 2016 CD SOW for the RDWA and associated data gaps evaluation which identified critical data needs to support EPA's requirements. The principal objective for this work is to provide data to support RD of the NE/CE Area wellfield and treatment system(s), with a secondary objective of providing data to support evaluation and potential design of reinjection of treated groundwater as a potential treated water end use for some or all of the treated groundwater. The issues/objectives are as follows:

Problem Statement (PS) 1: There is a need to refine the current understanding of lateral/vertical distribution of COCs exceeding drinking water maximum contaminant levels (MCLs) or notification levels (NLs) in the vicinity of the CE Area near Telegraph Road, to define the CE target extraction area. In addition, refinement of the understanding of hydrostratigraphic units in this area will support design of the NE/CE Area remedy.

PS 2: There is a need to refine the current understanding lateral/vertical distribution of higher concentration areas of COCs in the vicinity of the NE Area near Sorensen Avenue, to define the NE target extraction area. In addition, refinement of the understanding of hydrostratigraphic units in this area will support design of the NE/CE Area remedy.

PS 3: There is a need to refine the current understanding of water quality in the vicinity of the potential candidate reinjection areas to assess potential locations of reinjection. In addition, refinement of the understanding of hydrostratigraphic units in these areas will support design of the NE/CE Area remedy.

PS 4: There is a need to characterize hydraulic properties of the hydrostratigraphic units in the vicinity of the NE/CE Area to determine extraction rates necessary to establish hydraulic control of the target areas.

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PS 5: There is a need to characterize hydraulic properties of the hydrostratigraphic units in the vicinity of potential reinjection areas to assess viability of reinjection of treated groundwater.

PS 6: There is a need to monitor water levels in the RDWA vicinity to assess seasonal variations in the direction of groundwater flow and determine hydraulic gradients to support NE/CE Area wellfield design and future performance monitoring well locations.

PS 7: There is a need to characterize the Main COCs, Key Treatment Constituents, and additional treatment system water quality design parameters from the NE/CE Area target areas along with characterizing water quality in the vicinity of potential reinjection areas to support treatment train design for selected treated groundwater end use.

While not formal PSs outlined in this document, the following needs will be addressed during the RD:

- A numerical three dimensional groundwater flow model will be constructed to assess hydraulic performance of the integrated NE/CE Area wellfields and potential reinjection wellfields. The model construction and calibration is the subject of a separate work plan; however, the model will rely to a large degree on existing data and additional data collected during the PDI. These data include hydrostratigraphic, hydraulic testing, and water level data collected from new/existing wells.
- The capacity of existing spreading grounds and/or reclaimed water distribution systems will be evaluated using existing data/designs for respective end use. This data will be obtained from the operator/owner of the respective facility.

2.4 Data Quality Objectives Participants and Function

The PDI will be conducted under overall EPA oversight by several firms contracted to the 2016 CD Settling Work Defendants (SWDs). Their respective general responsibilities are summarized below:

- de maximis, inc. (de maximis) will serve as the SWDs' Project Coordinator, representing the SWDs, and responsible for overall coordination of the Work required under the 2016 CD, including the PDI.

- Hargis + Associates, Inc. (H+A) will serve as the technical lead for preparation of the PDI, and will conduct work at the direction of the Project Coordinator.
- CDM Smith, Inc. (CDM Smith) will serve as the technical lead for preparation of the RD Work Plan (RDWP), and will conduct work at the direction of the Project Coordinator
- Geosyntec Consultants (Geosyntec) will serve as the technical lead for preparation of the Work Area Monitoring Plan (WAMP), and will conduct work at the direction of the Project Coordinator
- Gnarus will provide review of selected technical documents, and will conduct work at the direction of the Project Coordinator

2.5 Project Resources

The SWDs will perform PDI activities and EPA will provide oversight. SWDs will use data collected during PDI activities, in conjunction with data generated from past and ongoing monitoring and investigation efforts in the RDWA. The work will be conducted in a timely fashion with the understanding that the process data collected throughout the PDI will be assessed and evaluated to determine whether sufficient data have been collected to support the RD of the NE/CE Area remedy.

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3. IDENTIFY GOALS OF PRE-DESIGN INVESTIGATION

Step 2 of the DQO process involves identifying the key questions that the study attempts to address, along with alternative actions or outcomes that may result based on the answers to these key questions.

3.1 Goals of the Pre-Design Investigation

PS 1: What are the nature of hydrostratigraphic units and the lateral/vertical extent of COCs exceeding MCLs or NLs in the vicinity of the CE Area near Telegraph Road? Lithologic and/or geophysical logs from existing and newly installed monitor wells along with water level information will be used to characterize the nature of hydrostratigraphic units in the vicinity of the CE target extraction area. COCs monitoring results from new and existing monitor wells will be used to refine the current understanding of the extent of Main COCs exceeding MCLs or NLs in the vicinity of the CE Area target extraction area.

PS 2: What are the nature of hydrostratigraphic units and the lateral/vertical distribution of the high COCs concentration area in the vicinity of the NE Area near Sorensen Avenue? Lithologic and/or geophysical logs from existing and newly installed monitor wells along with water level information will be used to characterize the nature of hydrostratigraphic units in the vicinity of the NE Area target extraction area. COCs monitoring results from new and existing monitor wells will be used to refine the current understanding of the extent of the high COCs concentration area in the vicinity of the NE Area target extraction area.

PS 3: What is the nature of hydrostratigraphic units and the water quality in the vicinity of the potential candidate reinjection areas? Lithologic and/or geophysical logs from existing and newly installed monitor wells along with water level information will be used to characterize the nature of hydrostratigraphic units in the vicinity of potential injection areas. COCs monitoring and Key Treatment Constituent results from new monitor wells will be used to assess the nature of COCs and Key Treatment Constituents in the vicinity of the potential candidate reinjection areas.

PS 4: What are the hydraulic properties of hydrostratigraphic units in the vicinity of the NE and CE Areas? Hydraulic testing data from new monitor wells and water level data from new/existing monitor wells along with existing hydraulic test data and water level elevations within respective hydrostratigraphic units will be used to assess the quantity of groundwater flowing through the target zones at the NE and CE Areas.

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PS 5: Are hydraulic properties of hydrostratigraphic units in the vicinity of potential reinjection areas sufficient to consider reinjection? Hydraulic testing data from new monitor wells within respective hydrostratigraphic units will be used to assess the ability of hydrostratigraphic units to accept treated groundwater. This will be a two-phase process; the first phase will involve short-term hydraulic testing to assess the quantity of groundwater that theoretically could be injected; and the second phase would involve a pilot injection test to verify there are no fatal flaws with reinjection into the respective hydrostratigraphic units.

PS 6: What is the direction of groundwater flow and gradient in and between hydrostratigraphic units and how does the direction of groundwater flow and hydraulic gradients vary through the water year? Water level elevations monitored periodically at new/key existing monitor wells in different hydrostratigraphic units will be used to prepare water level contour maps within hydrostratigraphic units to evaluate lateral variability in the direction of groundwater flow and gradient. These same data will be used to assess changes in vertical gradients between hydrostratigraphic units to assess potential for changes in vertical flow components during the same time frame.

PS 7: What is the design concentration for Main COCs and Key Treatment Constituents and how do other water quality parameters affect performance of selected treatment components? The concentration of Main COCs, Key Treatment Constituents and other water quality parameters from new and existing monitor wells and the estimated quantity of water flowing through hydrostratigraphic units from the respective target extraction zones (PS 4 and PS-6) will be used to determine the type and size of treatment components to meet the end use(s) of treated groundwater.

3.2 Possible Outcomes

PS 1: (1) The results of monitor well installation and sampling are sufficient to define the target extraction zone for the CE Area wellfield; or (2) additional data collection is required; in this case, the additional data required would be limited to delineation of the vertical extent of COCs exceeding MCLs or NLs in the vicinity of the CE Area.

PS 2: (1) The results of monitor well installation and sampling are sufficient to define the target extraction zone for the NE Area wellfield; or (2) additional data collection is required; in this case, the additional data required would be limited to delineation of the vertical extent of the higher concentration COCs area in the vicinity of the NE Area. For purposes of vertical delineation, the decision criteria would be assessed for COCs exceeding MCLs or NLs.

PS 3: (1) The results of monitor well installation and sampling are sufficient to further evaluate the respective reinjection area (continue with hydraulic testing); or (2) the results indicate reinjection is not likely to be viable either due to water quality and/or insufficient coarse zone hydrostratigraphic unit(s) to sustain injection; in this case, the contingency injection area would need to be investigated or reinjection would be eliminated from end use consideration; or (3) another candidate potential injection area, possibly including analysis of deep reinjection, would be investigated, or reinjection would be eliminated from end use consideration.

PS 4: (1) The results of short-term hydraulic testing at new/existing monitor wells are sufficient to support RD of the NE and CE Areas extraction wellfields; or (2) additional data collection is required to refine hydraulic properties of one or more of the hydrostratigraphic units within the NE and/or CE Areas to support remedy design, in this case a longer duration or higher extraction rate could be conducted on existing PDI monitor wells.

PS 5: (1) The results of short-term hydraulic testing and pilot injection test indicate reinjection of treated groundwater is viable in the respective area; or (2) the results of short-term hydraulic testing or pilot injection test indicates reinjection is not viable in the respective area; in this case, either the contingency injection area would need to be investigated or reinjection would be eliminated from end use consideration; or (3) another candidate potential injection area would need to be investigated, possibly including analysis of deep reinjection, or reinjection would be eliminated from end use consideration.

PS 6: (1) The water level monitoring data are sufficient to characterize direction of groundwater flow and gradient in hydrostratigraphic units; or (2) additional data collection is required to characterize direction of groundwater flow or gradient in one or more of the hydrostratigraphic units to support remedy design, in this case, additional data collection would be at existing and newly installed PDI monitor wells for an extended period of time.

PS 7: (1) The results of Main COCs, Key Treatment Constituents, and/or other water quality data are consistent and/or inconsistencies do not significantly affect design; or 2) additional sampling is required to resolve apparent anomalous data.

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4. IDENTIFY INFORMATION INPUTS

Step 3 of the DQO process determines the types and sources of information needed to resolve the decision statement or produce the desired estimates; whether new data collection is necessary; the information basis the planning team will need for establishing appropriate analysis approaches and performance or acceptance criteria; and whether appropriate sampling and analysis methodology exists to properly measure environmental characteristics for addressing the problem.

4.1 Data Needs for Pre-Design Investigation

PS 1 and PS 2: Lithologic logs from monitor well boreholes. If boreholes are advanced using mud rotary drilling methods the following geophysical logs will be run: caliper; gamma ray; spontaneous potential; short- and long-normal resistivity; and laterolog 3 (focused resistivity). Water level elevations from selected existing EPA and Water Replenishment District of Southern California (WRD) monitor wells will be monitored using pressure transducers early in the PDI data collection process to refine understanding and correlation of hydrostratigraphic units within the RDWA. An initial and confirmation groundwater sample will be collected for COC analyses from newly installed monitor wells and at selected existing monitor wells within the RDWA (CE and NE Areas). The sample locations and analytical requirements for groundwater samples have been compiled (Table B-2). The existing EPA and WRD monitor wells selected for early pressure transducer monitoring have also been compiled (Table B-3).

PS 3: Lithologic logs from monitor well boreholes. If boreholes are advanced using mud rotary drilling methods the following geophysical logs will be run: caliper; gamma ray; spontaneous potential; short- and long-normal resistivity; and laterolog 3 (focused resistivity). Groundwater samples will be collected for COCs analyses and for constituents and compounds included in the General Waste Discharge Requirements (WDR) permit for groundwater reinjection projects from newly installed monitor wells and at selected existing monitor wells within the potential reinjection areas. The sample locations and analytical requirements for groundwater samples have been compiled (Table B-2).

PS 4: Drawdown data will be collected from pumped monitor wells in the NE and CE Areas, and associated nearby monitor wells and more distant monitor wells completed in the same or adjacent hydrostratigraphic units as listed in Figure B-3 (Table B-4). Electronic pressure transducers and manual water level measurements will be collected along with extraction rate data from the pumped well. The drawdown and water level

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recovery data will be plotted using appropriate analytical solutions to estimate hydraulic conductivity of the hydrostratigraphic unit in the vicinity of the pumped monitor well.

PS 5: During the first phase, drawdown data will be collected from pumped monitor wells in the potential reinjection areas, and associated nearby monitor wells completed in the same or adjacent hydrostratigraphic units as listed in Figure B-3 (Table B-4). Electronic pressure transducers and manual water level measurements will be collected along with extraction rate data from the pumped well. The drawdown and water level recovery data will be analyzed using appropriate analytical solutions to estimate hydraulic conductivity of the hydrostratigraphic unit in the vicinity of the pumped monitor well. If the second phase of the testing is conducted, one pilot injection well will be constructed near the PDI monitor well in the respective reinjection area that exhibits the lowest estimated transmissivity. Potable water would be injected into the pilot injection well at a constant rate, and water level build up will be measured in the pilot injection well and the nearby monitor well. Electronic pressure transducers and manual water level measurements will be collected along with injection rate data for the injection test well. The water level build up and subsequent water level recovery data will be plotted and assessed to evaluate injection efficiency and potential for short-term fouling.

PS-6: Depth to water will be measured in newly installed PDI and existing EPA and WRD monitor wells within the RDWA on a periodic basis. As previously indicated (PS-1 and PS-2), electronic pressure transducers will be installed in selected EPA/WRD monitor wells within the RDWA early in the PDI program. The pressure transducers will be relocated from selected EPA/WRD monitor wells and installed in newly installed PDI monitor wells after the PDI monitor wells are developed. Water level elevations will be calculated using depth to water and elevation of reference point elevations that have been surveyed to a common datum. The existing EPA/WRD monitor wells that will be the subject of periodic manual water level measurements are identified in Table B-5. The newly installed PDI monitor wells at which manual and pressure transducer measurements will be acquired are identified in Table B-6.

PS-7: Groundwater samples will be collected from newly installed and selected existing monitor wells in the vicinity of the NE and CE Areas and analyzed for Main COCs, Key Treatment Constituents, and other water quality data parameters that influence treatment system design. The other water quality parameters include analyses for constituents and compounds included in the General WDR permit for groundwater reinjection projects, National Pollutant Discharge Elimination System (NPDES) for surface water discharge projects and water reclamation projects. The sample locations and analytical requirements for groundwater samples have been compiled (Table B-2).

4.2 Sources of Data

PS 1 through PS 3: Lithologic logs (and geophysical logs to the extent available) will be obtained from: 1) existing monitor/production well boreholes from EPA's OU2 RI, the WRD basin-wide database, the water purveyors in the area and from readily available site investigations conducted by SWDs and parties under the oversight of DTSC and/or the RWQCB-LA; and 2) data collected during the PDI. Water quality data from: 1) existing monitor wells from EPA's database, from the WRD basin-wide database, from State Water Resource Control Board Geotracker database, the State Water Resource Control Board Division of Drinking Water (DDW) database; and data compiled from readily available groundwater assessment/monitoring data collected by SWDs and other parties under the oversight of DTSC and/or the RWQCB-LA; and 2) data collected during the PDI. Water level elevation data for EPA and WRD monitor wells from: 1) EPA's database and the WRD database; and 2) data collected during the PDI.

PS 4 and PS 5: Hydraulic testing data will be obtained from: 1) existing monitor wells from the EPA's RI, the WRD basin-wide database, and from readily available site investigations conducted by SWDs and parties under the oversight of DTSC and/or the RWQCB-LA; and 2) data collected during the PDI.

PS 6: Water level data and reference point elevations will be obtained from: 1) existing monitor wells from the EPA's database, the WRD basin-wide database, the DDW database, and from readily available groundwater monitoring conducted by SWDs and parties under the oversight of DTSC and/or the RWQCB-LA; and 2) data collected during the PDI.

PS 7: Water quality data will be obtained from: 1) existing monitor wells from EPA's database, from the WRD basin-wide database, from State Water Resource Control Board Geotracker database, and data compiled from readily available groundwater assessment/monitoring data collected by SWDs and other parties under the oversight of DTSC and/or the RWQCB-LA; and 2) data collected during the PDI.

4.3 Action Levels

PS 1: No action levels are used in definition of hydrostratigraphic units; professional judgement will be used to define hydrostratigraphic units. Decision on the

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vertical/lateral extent of COCs exceeding MCLs/NLs within the bounds of OU2 depicted in the 2011 ROD will be based on groundwater samples collected from newly installed and existing monitor wells in the CE Area. Reporting limits for COCs should be below respective MCLs/NLs to delineate extent and depth of the CE Area wellfield. COCs will be analyzed using methods to the action levels listed in Table B-7. The decision criterion for additional PDI exploratory borehole/monitor well installation is outlined in Table B-8.

PS 2: No action levels are used in the definition of hydrostratigraphic units; professional judgement will be used to define hydrostratigraphic units. Decision on the vertical/lateral extent of higher concentration COCs will be based on groundwater samples collected from newly installed and existing monitor wells in the NE Area. Reporting limits for COCs can be above respective MCLs/NLs; however, for consistency purposes with other data collected during the PDI the reporting limits should be below respective MCLs/NLs. The analytical methods and reporting limits are specified in Table B-7. The decision criterion for additional PDI exploratory borehole/monitor well installation is outlined in Table B-8.

PS 3: No action levels are used in the definition of hydrostratigraphic units; professional judgement will be used to define hydrostratigraphic units. Decision on whether a potential reinjection can be considered for a specific area will be based on both the concentration of COCs and other key water quality parameters. Reporting limits for COCs should be the lower of the following: respective MCLs/NLs; or the WDR reporting limit. The analytical methods and reporting limits are listed in Table B-7.

PS 4: No action levels are used in the hydraulic testing of monitor wells.

PS 5: Decision on whether to conduct hydraulic testing of monitor wells in a specific reinjection area will be based primarily on the concentration of COCs from groundwater samples collected from PDI monitor wells installed in the respective area. The concentrations of COCs can be above the respective MCLs/NLs provided that the concentrations do not indicate that the reinjection area is in the vicinity of former/existing source areas that had not been previously identified. Decision on whether to conduct pilot injection testing in a specific reinjection area will be based on results of hydraulic testing of monitor wells. If the transmissivity from the monitor well hydraulic testing indicates that the ability to reinject is not practical, then pilot injection testing would not be conducted. The well in theory should be able to accept over 100 to

200 gallons per minute (gpm) without creating buildup of the water level to within about 10 feet of land surface.

PS 6. No action levels are used in water level data collection.

PS 7: Decision on treatment system components will be made based on the ability of the respective component to meet end use water quality treatment standards. Since there are multiple end uses being evaluated, the reporting limits for COCs and other water quality parameters should be the lower of the: MCL/NL; WDR reporting requirements; or NPDES reporting requirements. Reclaimed water reporting requirements are expected to fall within the WDR and NPDES reporting requirements and are therefore inherently incorporated into the sampling plan with overlap of other programs. The sampling program includes collection of a wide suite of constituents and compounds including those related to end use permitting. Many of the compounds/constituents evaluated as part of end use permitting are not anticipated to be detected in groundwater (e.g. pesticides, herbicides, asbestos, dioxins, etc.) or if detected in groundwater are not anticipated to be above background (e.g. radium, strontium, gross beta, etc.). As such, these broader based constituents/compounds will be screened in selected monitor wells in the NE/CE Areas, if the results of the respective analysis in the selected monitor wells do not exceed action levels, where applicable, then no additional screening sampling will be conducted. Conversely, if one or more are detected above respective screening levels, the initial well and remaining PDI monitor wells will be sampled and analyzed for the respective constituent(s)/compound(s). The analytical methods and reporting limits are listed in Table B-7.

4.4 Method Availability

PS 1 through PS 7: Methods are available to achieve the above action levels for field and laboratory data (with the below minor exceptions) and are discussed further in the Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). Exceptions are as follows:

- There are multiple compounds that have laboratory reporting limits which exceed detection limit for purposes of reporting (DLR) outlined in Table B-8. For most of these compounds the laboratory Method Detection Limits (MDLs) are below drinking water MCLs (or NLs if MCLs not available) for the respective compounds, where applicable, and are adequate for purposes of the

PDI. The following outlines exceptions to the above. None of the following compounds/constituents were identified as COPCs in the RI Report:

- The MDL for coliform is 2 Most Probable Number per 100 milliliters (MPN/100ml) and the screening level is 1.1 MPN/100ml. Coliform is not expected to be of concern and the MDL is close to screening level; therefore, the data are expected to be adequate for purposes of the PDI;
- The MDL for 4-Chloro-3-Methylphenol is 1.8 ug/l and the DLR is 1 ug/l. There is no MCL or NL for this compound. 4-Chloro-3-Methylphenol is not expected to be of concern and the MDL is close to DLR; therefore, the data are expected to be adequate for purposes of the PDI; and
- The MDL for N-Nitrosodi-n-propylamine is 0.035 ug/l and the DLR and NL are 0.01 ug/l. N-Nitrosodi-n-propylamine is not expected to be of concern and the MDL is close to DLR/NL; therefore, the data are expected to be adequate for purposes of the PDI.

5. DEFINE THE BOUNDARIES FOR PRE-DESIGN INVESTIGATION

In Step 4 of the DQO process, the target population of interest and the spatial and temporal features pertinent for decision making or estimation are identified. Practical constraints that could interfere with sampling should also be identified in this step. A practical constraint is any hindrance or obstacle (such as fences, property access, water bodies) that may interfere with collecting a complete data set.

5.1 Population of Interest

PS 1: Groundwater.

PS 2: Groundwater.

PS 3: Groundwater.

PS 4: Groundwater.

PS 5: Groundwater.

PS 6: Groundwater.

PS 7: Groundwater and end use of treated groundwater.

5.2 Physical Boundaries

PS 1: The lateral investigation boundaries in the CE Area are the vicinity of Telegraph Road bounded on the east and west by the boundary of OU2 as depicted in the 2011 ROD (Figure B-1). The vertical investigation boundary is defined by land surface at the top and the deepest monitor well screened in groundwater containing COCs exceeding MCL or NL at the bottom.

PS 2: The lateral investigation boundaries in the NE Area are the vicinity of Sorensen Avenue bounded on the east and west by the boundary of OU2 as depicted in the 2011 ROD (Figure B-1). The vertical investigation boundary is defined by land surface at the top and the deepest monitor well screened in groundwater containing elevated concentrations of COCs at the bottom. As indicated previously, decision criteria for delineating the bottom would be conservatively based on COCs exceeding MCLs or NLs.

PS 3 and PS 5: The lateral investigation boundaries for the primary potential reinjection area are OU2 on the east, Interstate Highway 605 on the west, Washington Boulevard on the north, and Los Nietos Road on the south (Figure B-1). The vertical investigation boundary is defined by land surface at the top and the base of the Gaspur aquifer at the bottom. The lateral investigation boundaries for the contingency potential reinjection area are OU2 on the east, Interstate Highways 5 and 605 on the west, Pioneer Boulevard on the north, and Florence Avenue on the south. The vertical investigation boundary is defined by land surface at the top and the base of the Gage aquifer at the bottom. In the case that the above-referenced shallow potential reinjection areas are not viable, the lateral investigation boundaries for the contingency potential deep reinjection area are OU2 on the east, Interstate Highways 5 and 605 on the west, Slauson Avenue on the north, and Telegraph Road on the south. The vertical investigation boundary is defined by land surface at the top and approximately 500 feet below land surface at the bottom.

PS 4: For the CE and NE Areas the boundaries are similar to PS 1 and PS 2, respectively.

PS 6 and PS 7: The lateral investigation boundaries are defined by the RDWA (Figure B-1). The vertical investigation boundaries can vary by location within the lateral investigation boundaries and are defined by the water table at the top and the deepest existing or newly installed PDI monitor well in the respective area at the bottom.

5.3 Temporal Boundaries

PS 1 through 5: Collection of lithologic, water quality, and hydraulic data in the CE Area, NE Area, and potential reinjection areas needs to be conducted prior to initiating wellfield or treatment system design and completed before final groundwater model construction and calibration.

PS 6: Collection of manual water level and downloading of transducer data should be initiated after the respective monitor well has been installed and developed on a quarterly basis until the PDI Report is submitted. After the PDI Report is submitted, water level monitoring would be implemented in accordance with the monitoring schedule outlined in the WAMP.

PS 7: Collection of COCs water quality data would ideally be conducted on a quarterly basis at newly installed PDI monitor wells after collecting initial and confirmation samples as part of PS 1 through PS 3 and be completed during a contemporaneous sampling event after all of the PDI monitor wells have been installed, before the PDI Report is submitted (Table B-2). Collection of Key Treatment Constituent, general chemistry, treatment system design, and emergent compound water quality data would also be conducted before the contemporaneous event to ensure that these compounds/constituents also have two sampling events prior to treatment system design. Collection of other water quality data associated with end use permitting would be conducted at selected monitor wells during the contemporaneous event.

5.4 Potential Difficulties in Field Data Collection

PS 1 through PS 3: Potential difficulties that may be encountered during the field investigation include arranging access to the desired locations for monitor well installation, and/or potential for inclement weather that could significantly delay data collection efforts. In addition, scheduling qualified drilling/development contractors may be difficult given their current demand associated with the California drought.

PS 4 and PS 5: Potential difficulties that may be encountered during the field investigation include arranging access to the desired locations for hydraulic testing, and/or potential for inclement weather that could significantly delay data collection efforts. These difficulties are anticipated to be less significant than those outlined for PS 1 to PS 3. In addition, scheduling qualified pump setting contractors may be difficult given their current demand associated with the California drought.

PS 6 and PS 7: Potential loss of access to monitor well locations, due to land owner/operator actions or inactions, could significantly delay data collection efforts.

5.5 Specifying the Scale of Estimates to be Made

PS 1 through PS 7: Water quality, water level, and hydraulic data can vary laterally and vertically. In environments such as the one observed in OU2, the vertical variability can be relatively great over relatively small vertical distances when compared to lateral variability over similar distances. This is typical in aquifer (relatively coarse sediment) and aquitard (relatively fine sediment) sequences. It is anticipated that the NE Area and CE Area individual extraction wells will have screened intervals ranging from approximately 50 feet to 100 feet or more and most of the groundwater produced from these extraction wells will be from the coarse sediments. Therefore the PDI monitor wells will target one or multiple coarse sediment sequences that would likely comprise a subset of the extraction well screen. Given this, it is expected that PDI monitor wells will have screened intervals ranging from approximately 20 feet to 50 feet in length. The lateral variations in water quality in the vicinity of the NE Area and CE Area wellfields will be assessed by installing monitor wells in the target vertical intervals with lateral separation of approximately 1,000 feet transverse to the direction of groundwater flow, to estimate lateral variations in water quality across the width of the target extraction wellfields in the NE and CE Areas. The newly installed monitor wells and existing monitor wells will be assigned a hydrostratigraphic unit designation based on water level elevation, water level trends, lithologic data, and water quality data. The designation of hydrostratigraphic units will be used in future interpretative maps where water levels, water quality, and hydraulic data are grouped by representative hydrostratigraphic units. This approach effectively incorporates the relatively large vertical variability and allows for more effective interpolation of data over larger lateral distances.

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6. DEVELOP PROCESS TO COMPLETE PRE-DESIGN INVESTIGATION

Step 5 of the DQO process involves developing an analytic approach that guides the analysis of the study results and draws conclusions from the data. The outputs from the previous four steps are integrated with the parameters developed in this step. For decision problems, the theoretical decision rule is an unambiguous "If...then...else..." statement. For estimation problems, this will result in a clear specification of the estimator (statistical function) to be used to produce the estimate from the data.

6.1 Statistical Parameter to Be Used

PS 1 through PS 3: Individual data points for lithologic logs, geophysical logs and water level elevation data. Geometric mean of water quality data collected during the PDI from each individual monitor well.

PS 4 through PS 6: Individual data points.

PS 7: Average of available data for each individual monitor well.

6.2 Action Levels

PS 1 through PS 7: See Step 3 of DQOs for action levels.

6.3 Analytical Approach

PS 1: The project team in consultation with EPA will incorporate existing and newly acquired PDI data collected in the CE Area to define the target extraction interval for this wellfield. The following sources of information will be used to identify the target extraction interval:

- Review lithologic and geophysical logs in the CE Area.
- Review water levels in the CE Area to assess vertical gradients between well clusters.
- Assess hydrostratigraphic units in the CE area.
- Review COC water quality data for hydrostratigraphic units in the CE Area to determine the target interval of the wellfield extraction target by comparing to the respective MCLs or NLs outlined in Table B-7.

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The results of the above evaluation will be used to develop the following maps, tables and diagrams to evaluate the extent of COCs exceeding MCLs/NLs across the width of OU2 in the CE Area.

- Tabulated summaries of well construction information, ground water elevation data, and analytical results.
- Hydrogeologic cross section across width of OU2 in the vicinity of Telegraph Road.
- Posted water level elevations for each monitor well on the hydrogeologic cross section.
- Posted water level elevations versus time for each monitor well cluster monitored using pressure transducers in and adjacent to the CE Area.
- Posted geometric mean of COCs concentrations in groundwater samples collected during the PDI on hydrogeologic cross sections to assess the vertical and lateral extent of COCs exceeding MCLs or NLs in the CE Area.

PS 2: The project team in consultation with EPA will incorporate existing and newly acquired PDI data collected in the NE Area to define the target extraction interval for this wellfield. The following sources of information will be used to identify the target extraction interval:

- Review lithologic and geophysical logs in the NE Area.
- Review water levels in the NE Area to assess vertical gradients between well clusters.
- Assess hydrostratigraphic units in the NE Area.
- Review COCs water quality data for hydrostratigraphic units in the NE Area to determine the target interval of wellfield extraction focusing on the higher concentration areas.

The results of the above evaluation will be used to develop the following maps, tables and diagrams to evaluate the extent of COCs exceeding MCLs/NLs across the width of OU2 in the NE Area.

- Tabulated summaries of well construction information, ground water elevation data, and analytical results.

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- Hydrogeologic cross section across the width of OU2 in the vicinity of Slauson and Sorensen Avenues.
- Posted water level elevations for each monitor well on the hydrogeologic cross section.
- Posted water level elevations versus time for each monitor well cluster monitored using pressure transducers in and adjacent to the NE Area.
- Posted geometric mean of COCs concentrations on hydrogeologic cross sections in groundwater samples collected during the PDI to assess the vertical and lateral extent of the higher concentration COCs areas in the NE Area.

PS 3: The project team will incorporate existing and newly acquired PDI data collected in potential reinjection areas to define candidate target injection intervals for returning treated groundwater to the aquifers. The following sources of information will be used to identify the target injection interval:

- Review lithologic and geophysical logs in the candidate reinjection areas.
- Assess shallow hydrostratigraphic units in the candidate shallow reinjection area (deep units would be assessed in the event that contingency deep reinjection is evaluated).
- Review water quality data for shallow hydrostratigraphic units in the candidate reinjection area (deep water quality data would be evaluated if contingency deep reinjection is evaluated).

The results of the above evaluation will be used to develop the following maps, tables and diagrams to evaluate the depth and geometry of the potential candidate reinjection area.

- Tabulated summaries of well construction information, ground water elevation data, and analytical results.
- One to two hydrogeologic cross sections across the candidate reinjection area.
- Posted water level elevations for each monitor well on each of the hydrogeologic cross sections.
- Posted water level elevations versus time for each monitor well monitored using pressure transducers in and adjacent to the candidate reinjection areas.

- Posted geometric mean of COCs concentrations on hydrogeologic cross sections in groundwater samples collected during the PDI on the hydrogeologic cross sections to assess the general distribution of COCs within the candidate reinjection area.
- Other posted Key Treatment Constituent parameters on the hydrogeologic cross sections to assess the general distribution and variability of these parameters within the candidate reinjection area.

PS 4: The project team will incorporate existing and newly acquired PDI data collected in the CE and NE Areas to refine estimates of transmissivity and hydraulic conductivity within the target extraction intervals for these wellfields. The following sources of information will be utilized:

- Review water level drawdown and recovery data and background water levels within similar hydrostratigraphic units in the area to determine whether water level correction factors are required.
- Select appropriate analytical solution and plot water level drawdown over time and estimate transmissivity of interval tested.
- Review lithologic and geophysical logs in the vicinity of a respective well to determine the approximate percentage of coarse sediments within the screened interval to assist in estimating the range of hydraulic conductivity of the screened interval.

The results of the above evaluation will be used to develop the following maps, tables and diagrams to evaluate the hydraulic properties of the extraction intervals in CE and NE Areas as well as throughout the RDWA:

- Tabulated summaries of water level drawdown/recovery from pumped and observation wells and extraction rates for the pumped well.
- Water level drawdown/recovery versus time plots for test and observation wells.
- Posted water level elevations versus time for a monitor well in a respective hydrostratigraphic unit not influenced by pumping of a nearby monitor well during hydraulic testing.
- Posted transmissivity and hydraulic conductivity estimates (PDI and existing) for hydrostratigraphic units on plan view figures to assess the lateral variations within respective units.

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PS 5: The project team will implement this activity in two phases: the first involves hydraulic testing of the monitor wells; and the second phase, if conducted, involves injection of potable water into a pilot injection well. The project team will incorporate existing and newly acquired PDI data collected in the potential reinjection areas to refine estimates of transmissivity and hydraulic conductivity within the target injection intervals for the respective reinjection wellfields. The team will evaluate the viability of reinjection in a potential reinjection area and, if the area is a candidate for reinjection, a pilot injection test would be conducted in a pilot injection well installed next to one of the monitor wells in the respective candidate reinjection area. The following sources of information will be utilized:

- During the first phase, review water level drawdown and recovery data and background water levels within similar hydrostratigraphic units in the area to determine whether water level correction factors are required.
- During the first phase, select the appropriate analytical solution and plot water level drawdown over corrected time and estimate the transmissivity of the interval tested.
- During the first phase, review lithologic and geophysical logs in the vicinity of a respective well to determine the approximate percentage of coarse sediments within the screened interval to assist in estimating the range of hydraulic conductivity of the screened interval.
- At the end of the first phase, assess viability of reinjection by reviewing transmissivity estimates, available buildup (conceptually to within about 10 feet of land surface) and well efficiency to determine whether the reinjection area can potentially sustain reinjection of a substantial portion of the treated groundwater (over 100 to 200 gpm).
- The second phase would be implemented if the project team's assessment of first phase data indicates that a potential area is a candidate for reinjection.

The results of the above evaluation will be used to develop the following maps, tables and diagrams to evaluate the potential viability of reinjection in subject areas.

- Tabulated summaries of water level drawdown/recovery from pumped and observation wells and extraction rate for the pumped well.
- Water level drawdown/recovery versus corrected time plots for test and observation wells.

- Posted water level elevations versus time for a monitor well in a respective hydrostratigraphic unit not influenced by pumping/injection of a nearby monitor well during the hydraulic testing.
- Posted transmissivity and hydraulic conductivity estimates (PDI and existing) for hydrostratigraphic units on plan view figures to assess the lateral variations within respective units in the reinjection areas.
- If the second phase is implemented, tabulated summaries of water level build-up/recovery at the pilot injection well along with plots of water level build-up and recovery at the adjacent monitor well.

PS 6: The project team will incorporate existing and newly acquired PDI data collected to refine estimates of hydraulic gradient and direction of groundwater flow within hydrostratigraphic units throughout the RDWA. The following sources of information will be utilized:

- Review pressure transducer data to assess the nature and magnitude of water level changes in key monitor well clusters and to assess the degree of hydraulic communication within and between hydrostratigraphic units.
- Review water level contour maps on a quarterly basis until the PDI is complete to assess the direction of groundwater flow and seasonal variability within hydrostratigraphic units.

The results of the above evaluation will be used to develop the following maps, tables and diagrams to evaluate the direction of groundwater flow within hydrostratigraphic units and the seasonal variability in water levels and direction of groundwater flow.

- Tabulated summaries of manual and pressure transducer water level data from PDI and existing monitor wells.
- Posted water level elevations versus time for key well clusters with pressure transducer data to illustrate the variability in water level elevations within and between hydrostratigraphic units.
- Water level contour map for each monitoring event for each hydrostratigraphic unit to illustrate the direction of groundwater flow within the respective unit during each event.
- Calculated water level gradients within hydrostratigraphic units in the vicinity of the NE and CE Areas for each monitoring event.

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PS 7: The project team will incorporate existing and newly acquired PDI data collected to refine estimates of influent water quality for COCs and parameters pertinent to different end uses of treated groundwater (end use parameters). The following sources of information will be utilized:

- Review range of Main COCs and Key Treatment Constituent parameters for each hydrostratigraphic unit within the extraction target interval of the NE and CE Area wellfields. The average concentration for each hydrostratigraphic unit in the NE and CE Areas (individually) will be used in conjunction with the estimated groundwater flow through the respective hydrostratigraphic unit (see below) to estimate the expected average influent concentration. If the Main COC is non-detect, the concentration will be assumed to be one-half the MDL.
- Review range of hydraulic gradients for each hydrostratigraphic unit within the extraction target interval of the NE Area and CE Area wellfields. The average hydraulic gradient for each hydrostratigraphic unit will be used to estimate groundwater flow through the respective hydrostratigraphic unit in conjunction with transmissivity and width of the target interval (see below).
- Review range of transmissivity for each hydrostratigraphic unit within the extraction target interval of the NE Area and CE Area wellfields to determine average transmissivity for each hydrostratigraphic unit in conjunction with the width of the target interval and the average hydraulic gradient (see above) will be used to estimate groundwater flow through the respective hydrostratigraphic unit using Darcy's law.
- Review the above data to develop estimates of average influent concentration for the NE and CE Area wellfields and the combined NE/CE Areas wellfields by using flow weighted average concentrations for hydrostratigraphic units within the target extraction interval of the respective wellfields. The estimated flow weight concentrations would be compared to respective levels summarized in Table B-7.

The results of the above evaluation will be used to develop the following maps, tables and diagrams to estimate the influent COCs and end use parameters for the NE Area and CE Area extraction wellfields.

- Tabulated summaries of Main COCs and Key Treatment Constituent parameters from PDI and existing monitor wells in the vicinity of the CE Area and NE Area wellfields organized by hydrostratigraphic unit.

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- Tabular summaries of estimated groundwater flow through the width of the target extraction interval for the NE and CE Area wellfields for each hydrostratigraphic unit.
- Tabular summaries of calculated estimated flow weighted concentration for Main COCs and Key Treatment Constituent parameters for hydrostratigraphic units within the target extraction intervals of the NE Area and CE Area wellfields.
- Comparison of estimated flow weighted concentration for Main COCs and Key Treatment Constituent parameters and respective levels summarized in Table B-7. The comparison will include the NE Area wellfield, CE Area wellfield and combined NE/CE Area wellfields.

7. SPECIFY ACCEPTANCE CRITERIA FOR PRE-DESIGN INVESTIGATION

Step 6 of the DQO process acknowledges the reality that perfect information or unlimited data will not be available from which to formulate conclusions. It also acknowledges that these data are subject to various types of errors due to such factors as how samples were collected, how measurements were made, etc. As a result, estimates or conclusions that are made from the collected data may deviate from what is objectively true. Therefore, there is a chance that erroneous conclusions will be made based on data collected, or that the uncertainty in estimates will exceed acceptance criteria. This step of the DQO process, therefore, derives the performance or acceptance criteria that the collected data will need to achieve in order to minimize the possibility of either making erroneous conclusions or failing to keep uncertainty in estimates to within acceptable levels. Performance criteria, together with the appropriate level of Quality Assurance practices, will guide the design of new data collection efforts, while acceptance criteria will guide the design of procedures to acquire and evaluate existing data relative to the intended use.

This step of the DQO process is generally not applicable to activities supporting PDI because the sampling design (i.e., locations for monitor well installation, hydraulic testing and ground water monitoring) was selected based on a review of existing hydrogeologic and geochemical data and is based on professional judgment. As such, the predominant quantitative variability is field and laboratory analyses measurement errors. Field and laboratory measurement errors are minimized by following Standard Operating Procedures (SOPs) for respective data collection activities as outlined in the FSP and QAPP.

8. DEVELOP PLAN FOR COMPLETING PRE-DESIGN INVESTIGATION

By performing Steps 1 through 6 of the DQO process, a set of performance or acceptance criteria has been developed that the collected data will need to achieve. The goal of Step 7 is to develop a resource-effective design for collecting and measuring environmental samples, or for generating other types of information needed to address the problem. This corresponds to generating either (a) the most resource-effective data collection process that is sufficient to fulfill study objectives, or (b) a data collection process that maximizes the amount of information available for synthesis and analysis within a fixed budget. In addition, this design will lead to data that will achieve performance or acceptance criteria.

The SWDs have developed an optimized plan to collect and analyze PDI data in a time efficient manner. The plan incorporates concurrent implementation of selected tasks and also incorporates sequential data collection to minimize wasted or inefficient data collection efforts. The following outlines the plan for implementing PDI tasks.

PS 1 and PS 2: The SWDs plan to install 7 exploratory boreholes and 24 new monitor wells at seven locations (Figure B-3). Three exploratory boreholes and 11 monitor wells are located in the NE Area. Four exploratory boreholes and 13 monitor wells are located in the CE Area. The SWDs plan to conduct the work in three successive steps, with the first step consisting of obtaining access to exploratory boring/monitor well locations and installation of pressure transducers in selected existing monitor wells. The second step consists of installation of exploratory boreholes and the deepest monitor wells in the NE and CE Areas (one exploratory borehole and one deep monitor well at seven locations). The SWDs will use the results of the first and second steps to identify and correlate hydrostratigraphic units and select screen intervals for each of the remaining 17 monitor wells in the CE and NE Areas. The following tasks will be implemented:

- Task 1 activities include the following:
    - Access will be negotiated with the City/County for the installation and testing of exploratory boreholes and monitor wells. This will be conducted for all NE Area and CE Area locations prior to mobilizing for exploratory borehole/monitor well installation.
    - Installation of pressure transducers at 28 existing monitor wells at 11 cluster locations (Figure B-3). These monitor well clusters are located throughout the RDWA. The trends in water level elevation

variations within and the difference between hydrostratigraphic units will be used to refine the understanding of the nature and distribution of hydrostratigraphic units within the RD Work Area. This information will support PDI monitor well installation, particularly during Task 3. The existing monitor wells were installed by EPA as part of the 2010 RI and the WRD to assess stratigraphy in the area at and to the south of the crest of a mapped anticline crossing OU2. The monitor wells are screened within different hydrostratigraphic units (Table B-3). Prior water level monitoring at existing EPA monitor wells was used to help select the monitor wells to be outfitted with pressure transducers.

  - The transducers at the 28 existing monitor wells will be moved from the existing monitor wells to newly installed PDI monitor wells as the new PDI monitor wells are installed (Tasks 3 and 4). Manual water level measurements and transducer downloads will be conducted at the existing monitor wells on a quarterly basis until the transducer from the respective existing monitor well is relocated to a PDI monitor well.

- Task 2 activities include the following:
  - Drilling and logging of seven exploratory boreholes using mud rotary drilling methods (Figure B-3). The total depth of each exploratory borehole extends to the deeper of the following two hydrostratigraphic units: the bottom of EPA's hydrostratigraphic Unit 6 or the bottom of the Lynwood aquifer as described in Bulletin 104 (Figure B-4) (CDWR, 1961). The exploratory borehole will also be geophysically logged to characterize subsurface lithology.
  - The lithologic and geophysical logs from the exploratory borings will be reviewed along with available water levels obtained using pressure transducers in Task 1, and the exploratory borehole will be used to install the deepest monitor well in each well cluster. The deepest monitor well is conceptually targeting the Jefferson or Lynwood Aquifers depending on well location (Table B-8). The bottom of the exploratory borehole will be properly sealed from the total depth to near the bottom of the deepest monitor well.
  - The monitor well at each location will be developed using appropriate bailing, surging, and/or pumping methods.
  - Following well development, an initial groundwater sample will be collected for COCs analysis, and a pressure transducer will be relocated

from one of the step 1 monitor wells to the newly installed PDI monitor well. A confirmation sample will be collected from the respective monitor well approximately 6 weeks after the initial groundwater sample. The confirmation sample will be analyzed for Main COCs, Key Treatment Constituents, treatment design constituents, general chemistry, and emergent compounds (Tables B-2 and B-7). After the initial and confirmation samples have been collected, the COCs results will be evaluated to determine if deeper monitor well(s) need to be installed (Table B-8).

- Task 3 activities include the following:
  - The project team in consultation with EPA will select screen intervals for the 17 additional monitor wells at eight locations based on: evaluation of lithologic data from existing and newly installed PDI monitor wells and exploratory boreholes; water level elevations monitored using pressure transducers during Tasks 1 and 2; and recent water level and water quality data from nearby existing monitor wells (WAMP and PDI Task 6).
  - Drilling, logging and installation of 17 monitor wells at eight locations (Figure B-3). These monitor wells will be installed using sonic or hollow-stem auger drilling methods. Most of the monitor wells conceptually target saturated aquifers above the Jefferson or Lynwood aquifers (Table B-8).
  - The newly installed monitor wells will be developed using appropriate bailing, surging and/or pumping methods.
  - Following well development, an initial groundwater sample will be collected for COCs analysis and a pressure transducer will be relocated from one of the Task 1 monitor wells to the newly installed PDI monitor well. A confirmation sample will be collected from the respective monitor well approximately 6 weeks after the initial groundwater sample. The confirmation sample will be analyzed for Main COCs, Key Treatment Constituents, treatment design constituents, general chemistry, and emergent compounds (Tables B-2 and B-7).
  - After the last NE and CE PDI monitor well has been installed and initial samples have been collected from the respective monitor well, a comprehensive groundwater monitoring event will be conducted as part of Task 6 (refer to PS 6 and PS-7).

- The target zone for groundwater extraction wellfields in the NE and CE Areas will be determined by the project team in consultation with EPA after the COCS analytical results are received from the initial and confirmation samples collected from PDI monitor wells and recent samples from selected monitor wells (from Task 6) in the NE and CE Areas.

PS 3: The SWDs plan to install four monitor wells at four locations in the primary candidate reinjection area (Figure B-3). The SWDs have identified a contingency candidate shallow reinjection area and may, pending results from the primary reinjection area, install three monitor wells at three locations (Figure B-3). If needed, deep reinjection might be evaluated if the results of the candidate shallow reinjection areas do not support reinjection end use and the SWDs do not screen reinjection as an end use. The approach to assessing the deep reinjection area(s) would be similar to the scope of evaluating shallow reinjection areas, but at greater depths within the RDWA. Should deeper reinjection evaluation be pursued, a new FSP would be prepared for EPA review and concurrence prior to conducting the deep reinjection area investigation. The SWDs plan to conduct the work in the primary candidate reinjection area during Task 4. The following outlines the activities for Task 4 (note the same activities would be conducted in the contingency candidate reinjection area if needed).

- Obtain access:
    - Access will be negotiated with the City/County for the installation and testing of monitor wells. This will be conducted for all locations within the candidate reinjection area prior to mobilizing for monitor well installation.
- After access is obtained to all of the locations within the respective candidate reinjection area, the following activities will be conducted:
    - Drilling and logging of four shallow monitor wells (3 for contingency candidate area if needed) using rotosonic drilling methods (Figure B-3). The total depth of each monitor well extends slightly below the bottom of the first saturated aquifer at each location (Table B-8).
    - The monitor wells at each location will be developed using appropriate bailing, surging, and/or pumping methods.
    - Following well development, groundwater samples will be collected for Main COCs, Key Treatment Constituents, general chemistry, emergent

compounds, and parameters associated with WDR permit analyses (Tables B-2 and B-7), and a pressure transducer will be relocated from one of the Task 1 monitor wells to the newly installed PDI monitor well. The initial groundwater samples will be collected approximately 1 month after the final monitor well is installed within the respective candidate reinjection area, and a confirmation sample will be collected approximately 6 weeks later. The project team in consultation with EPA, will evaluate lithologic, well development, and water quality data after confirmation sample results have been received to determine whether to continue testing in the respective candidate reinjection area (Hydraulic Testing as part of Task 5, refer to PS 5). If testing is discontinued in the respective reinjection area, the SWDs will evaluate whether to continue reinjection evaluations at contingency reinjection area(s). If evaluations continue at contingency reinjection area(s), the steps outlined as part of Task 4 will be conducted in the respective candidate reinjection area.

PS 4: The SWDs anticipate conducting hydraulic tests to assess aquifer properties at the newly installed PDI monitor wells in the NE and CE Areas after well installation and results of initial and confirmation samples have been received as part of Task 5. The hydraulic testing conducted at the NE/CE Area PDI monitor wells during Task 5 will include the following:

- The project team will review drawdown data from new monitor wells collected during development to determine the appropriate extraction rate for a short-term constant rate discharge test. The test pump will be appropriately sized, but will not exceed a capacity of 60 gpm.
- The selection of observation wells and pumped wells will be reviewed by the project team. Observation wells have been tentatively identified for each monitor well hydraulic test (Table B-4). The observation wells include: nearby monitor wells to assess water level response due to pumping of the test well; and a monitor well screened within the same hydrostratigraphic unit as the pumped well, that is farther away (outside the influence of the short-term hydraulic test) to assess water level variations associated with regional hydraulic stresses.
- The hydraulic test will be initiated by extracting groundwater from the pumped well at a constant rate with manual and transducer water level monitoring in the pumped and observation wells.

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- The water level responses and extraction data will be processed and analyzed using appropriate analytical solutions to estimate hydraulic conductivity and transmissivity of the tested hydrostratigraphic unit at each test location.

PS 5: Pending results of well installation, development and sampling of PDI monitor wells in the respective candidate reinjection area, the SWDs anticipate conducting hydraulic/injection tests in two phases in Task 5. The first phase consists of hydraulic testing at each monitor well to assess aquifer properties in the respective reinjection area. If the results of the first phase support continued evaluation, a pilot injection well would be installed and tested at one location within the respective reinjection area. The two phases of Task 5 will include the following:

- Phase 1 activities include the following:
    - The project team will review drawdown data from new monitor wells collected during development to determine the extraction rate for the short-term hydraulic test. The test pump will be appropriately sized, but will not exceed a capacity of 60 gpm.
    - The observation wells for each test will include the closest two monitor wells and the most distant monitor well in the respective candidate reinjection area (Table B-4).
    - The hydraulic test will be initiated by extracting groundwater from the pumped well at a constant lowest rate. Manual and transducer water level monitoring in the pumped and observation wells will be performed.
    - The water level responses and extraction data will be processed and analyzed using appropriate analytical solutions to estimate hydraulic conductivity/transmissivity of the tested hydrostratigraphic unit.
    - The results of hydraulic testing at the monitor wells will be reviewed to determine if the next phase of testing is to be implemented. If the next phase of testing is not conducted in the respective reinjection area, the SWDs will evaluate whether to continue reinjection evaluations at contingency reinjection area(s). If evaluations continue at contingency reinjection area(s), the steps outlined as part of Tasks 4 and 5 will be conducted in the respective candidate reinjection area.
- Phase 2 activities include the following:

- o The project team will review hydraulic test data from new monitor wells to select the location of the pilot injection test and determine the injection rate.
- o A pilot injection well will be installed at the selected location within approximately 10 to 50 feet of the existing monitor well.
- o The pilot injection test will be initiated by injecting potable water from a nearby fire hydrant at a constant rate and obtaining manual and transducer water level data in the pilot injection well, adjacent monitor well, and other monitor wells within the reinjection area.
- o The water level responses and injection data will be processed and analyzed to assess the relative efficiency of injection, and assess any short-term injectability fatal flaws.

PS 6: The SWDs plan to monitor water level elevations at existing EPA and WRD monitor wells in the RDWA on a quarterly basis until the PDI field program is complete as part of Task 6. Some of these existing monitor wells are being monitored early in the PDI process as part of Task 1 (refer to PS 1 and PS 2). Water level monitoring of the respective monitor wells will continue under Task 1 until the transducer from the existing EPA/WRD monitor well is relocated to a PDI monitor well, at which time quarterly monitoring of the respective monitor well will be conducted as part of Task 6. Water level elevation and transducer downloads from PDI monitor wells will also be conducted as part of Task 6 on a quarterly basis starting after the first PDI monitor well is installed to the time the PDI field program is complete. To the extent there is overlap between the water level monitoring conducted as part of PDI and WAMP, the water level monitoring will be coordinated such that the data meets the requirements of both programs. The water level elevations obtained during Task 1 and Task 6 in conjunction with water level elevation data collected prior to and during PDI monitor well installation will be used to assess the direction of groundwater flow in hydrostratigraphic units and assess the potential for cross flow between hydrostratigraphic units. The monitoring locations and frequency of water level monitoring at existing EPA and WRD monitor wells have been compiled (Table B-5; Figure B-3).

PS 7: The SWDs plan to collect groundwater samples at newly installed PDI monitor wells and selected existing EPA and WRD monitor wells to support RD. There are several monitoring programs that involve collection of groundwater samples as follows:

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- Initial and confirmation samples at newly installed PDI monitor wells will be conducted as part of Tasks 2 and 3 (Refer to PS1 and PS2) as well as Task 4 (Refer to PS 3).
- Quarterly PDI groundwater sample collection as part of Task 6. This involves collection of groundwater samples for COCs analysis from selected EPA/WRD monitor wells and newly installed PDI monitor wells (following confirmation sampling of each respective PDI monitor well during Tasks 2 and 3) (Tables B-2 and B-7). The first quarterly sampling event will occur in the quarter following the completion of the confirmation sampling event at the first installed PDI monitor well. The last PDI quarterly sampling event will be complete before or in the same quarter that the initial groundwater sample is collected from the last installed PDI monitor well.
- Contemporaneous comprehensive PDI groundwater sample event as part of Task 6. This involves collection of groundwater samples for Main COCs, Key Treatment Constituents, treatment design and emergent compounds from selected EPA/WRD monitor wells and newly installed PDI monitor wells (Tables B-2 and B-7). In addition, groundwater samples from selected monitor wells in the NE/CE Area will be analyzed for other permit-related parameters (Table B-7). This event will be conducted in the quarter following the initial groundwater sample collected from the last PDI monitor well installed.
- Groundwater samples will also be collected for COCs analysis from existing EPA and WRD monitor wells as part of the WAMP. To the extent that there is overlap between the PDI and WAMP monitoring at the respective monitor wells, the sampling will be coordinated such that the data meet the requirements of both programs.

At the completion of the contemporaneous comprehensive PDI groundwater sampling event, the water quality results will be reviewed with EPA to determine whether there is apparently anomalous data that would require additional sampling to resolve.

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9. REFERENCES

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APPENDIX B TABLES

TABLE B-1

MAIN CHEMICALS OF CONCERN AND KEY TREATMENT CONSTITUENTS

Main Chemicals of Concern (COCs)	
Volatile Organic Compounds	Trichloroethene (TCE)
	Tetrachloroethene / Perchloroethene (PCE)
	Trichlorofluoromethane (Freon 11)
	1,1,2-Trichloro-1,2,2,-trifluoroethane (Freon 113)
	1,1-Dichloroethene (1,1-DCE)
	cis-1,2-Dichloroethene (cis-1,2-DCE)
	chloroform
	carbon tetrachloride
	1,1-Dichloroethane (1,1-DCA)
	1,2-Dichloroethane (1,2-DCA)
	1,1,2-Trichloroethane (1,1,2-TCA)
Other	1,4-dioxane
	hexavalent chromium

Key Treatment Constituents	
Metals	Aluminum
	Total Chromium
	Manganese
	Selenium
General Chemistry	Nitrate
	Sulfate
	Total dissolved solids
Other	bis(2-Ethylhexyl)phthalate
	Perchlorate

TABLE B-2

PRE-DESIGN INVESTIGATION SAMPLING PROGRAM SCHEDULE

Well Identifier	Area	Timing and Analytes: Initial Sampling Program: Initial Sample Within 2-4 weeks of well development	Initial Sampling Program: Confirmation Sample Within 6 weeks of initial sample	Quarterly Sampling Program: Quarterly[4]	Quarterly Sampling Program: Quarterly following Installation	Final Sampling Event (After all wells installed)
PRE-DESIGN INVESTIGATION MONITOR WELLS						
NE-1 MWA	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-1 MWB	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-1 MWC	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-1 MWD	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-2 MWA	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-2 MWB	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-2 MWC	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-2 MWD	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-3 MWA	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-3 MWB	NE	COCs	Moderate List[1]		COCs	TBD[2]
NE-3 MWC	NE	COCs	Moderate List[1]		COCs	TBD[2]
CE-1 MWA	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-1 MWB	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-1 MWC	CE	COCs	Moderate List[1]		COCs	TBD[2]

TABLE B-2

PRE-DESIGN INVESTIGATION SAMPLING PROGRAM SCHEDULE

		Timing and Analytes				
		Initial Sampling Program		Quarterly Sampling Program		
Well Identifier	Area	Initial Sample Within 2-4 weeks of well development	Confirmation Sample Within 6 weeks of initial sample	Quarterly[4]	Quarterly following Installation	Final Sampling Event (After all wells installed)
CE-2 MWA	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-2 MWB	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-2 MWC	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-3 MWA	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-3 MWB	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-3 MWC	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-4 MWA	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-5 MWA	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-5 MWB	CE	COCs	Moderate List[1]		COCs	TBD[2]
CE-5 MWC	CE	COCs	Moderate List[1]		COCs	TBD[2]
INJ-1 MWA	PR	Moderate List[1]	Long List[3]		COCs	COCs
INJ-2 MWA	PR	Moderate List[1]	Long List[3]		COCs	COCs
INJ-3 MWA	PR	Moderate List[1]	Long List[3]		COCs	COCs
INJ-4 MWA	PR	Moderate List[1]	Long List[3]		COCs	COCs
CINJ-1 MWA	CR	TBD	TBD		TBD	TBD
CINJ-2 MWA	CR	TBD	TBD		TBD	TBD
CINJ-3 MWA	CR	TBD	TBD		TBD	TBD

TABLE B-2

PRE-DESIGN INVESTIGATION SAMPLING PROGRAM SCHEDULE

		Timing and Analytes				
		Initial Sampling Program		Quarterly Sampling Program		
Well Identifier	Area	Initial Sample Within 2-4 weeks of well development	Confirmation Sample Within 6 weeks of initial sample	Quarterly[4]	Quarterly following Installation	Final Sampling Event (After all wells installed)
EXISTING MONITOR WELLS						
MW-8A	NE			COCs		TBD[2]
MW-8B	NE			COCs		TBD[2]
MW-8C	NE			COCs		TBD[2]
MW-8D	NE			COCs		TBD[2]
MW-18A	NE			COCs		TBD[2]
MW-18B	NE			COCs		TBD[2]
MW-18C	NE			COCs		TBD[2]
MW-20A	CE			COCs		TBD[2]
MW-20B	CE			COCs		TBD[2]
MW-20C	CE			COCs		TBD[2]
MW-23A	NE			COCs		TBD[2]
MW-23B	NE			COCs		TBD[2]
MW-23C	NE			COCs		TBD[2]
MW-23D	NE			COCs		TBD[2]

TABLE B-2

PRE-DESIGN INVESTIGATION SAMPLING PROGRAM SCHEDULE

		Timing and Analytes				
		Initial Sampling Program		Quarterly Sampling Program		
Well Identifier	Area	Initial Sample Within 2-4 weeks of well development	Confirmation Sample Within 6 weeks of initial sample	Quarterly[4]	Quarterly following Installation	Final Sampling Event (After all wells installed)
MW-25A	NE			COCs		TBD[2]
MW-25B	NE			COCs		TBD[2]
MW-25C	NE			COCs		TBD[2]
MW-25D	NE			COCs		TBD[2]
SFS_Hawkins_1c_3	CE			COCs		TBD[2]
SFS_Hawkins_1c_4	CE			COCs		TBD[2]
SFS_Hawkins_1c_5	CE			COCs		TBD[2]

EXPLANATION

COCs Chemicals of concern
CE Central Extraction Area
NE Northern Extraction Area
PR Primary candidate reinjection area
CR Contingency candidate reinjection area
TBD To be determined

[1] COCs; Key Treatment Constituents; general chemistry; treatment system design; and emergent compounds

[2] Sampling at all existing and new monitor wells will include moderate list parameters, sampling of subset of these monitor wells (6 in NE and 6 in CE) will also be analyzed for permitting parameters.

[3] Long list of parameters includes moderate list plus permitting parameters

[4] Quarterly groundwater sampling program begins following initial sampling of first new monitor well

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TABLE B-3

EARLY TRANSDUCER PLACEMENT

Well Identifier	Land Surface Elevation feet msl	Measuring Point Elevation feet msl	Screen Interval feet bls	EPA Unit	DWR Unit
MW-8B	150.3	150.03	65 - 75	SB3	Gaspur
MW-8D	150.1	149.91	110 - 120	SB3, SB4	Hollydale
MW-16B	153.5	153.19	106 - 116	SB4, SB5	Hollydale
MW-17B	159.4	158.90	94 - 104	SB4	Hollydale
MW-17C	159.4	159.00	172 - 182	SB6	Lynwood
MW-18A	144.3	143.73	56 - 71	SB3, SB4	Hollydale
MW-18C	144.3	143.83	146 - 161	SB6	Jefferson-Lynwood Aquitard
MW-20B	142.1	141.32	122 - 132	SB4	Hollydale
MW-20C	142.1	141.35	180 - 190	SB6	Jefferson
MW-23B	149.4	149.06	82 - 97	SB3	Gaspur
MW-23C	149.4	149.07	145 - 160	SB5	Jefferson
MW-23D	149.4	148.04	175 - 185	SB6	Jefferson-Lynwood Aquitard
MW-24A	162.4	162.04	50 - 70	SB2	Gaspur
MW-24C	162.4	162.02	140 - 160	SB4, SB5	Jefferson
MW-25B	148.3	147.84	90 - 110	SB4, SB5	Hollydale
MW-25D	148.3	147.87	194 - 209	Deep Only	Lynwood
MW-26A	156.0	155.62	70 - 90	SB3	Hollydale
MW-26C	156.0	155.41	145 - 160	SB6	Jefferson
MW-26D	156.0	155.37	185 - 205	SB6	Lynwood

TABLE B-3

EARLY TRANSDUCER PLACEMENT

Well Identifier	Land Surface Elevation feet msl	Measuring Point Elevation feet msl	Screen Interval feet bls	EPA Unit	DWR Unit
MW-27A	139.5	139.24	90 - 110	SB3	Gage
MW-27B	139.5	139.18	144 - 164	SB4	Hollydale
MW-27C	139.5	139.17	180 - 190	SB5	Hollydale
MW-27D	139.5	139.13	200 - 210	SB5, SB6	Hollydale-Jefferson Aquitard
SFS_Hawkins_1a_1	147.8	147.40	480 - 490	Deep Only	Deep Only
SFS_Hawkins_1b_2	147.8	147.30	378 - 388	Deep Only	Deep Only
SFS_Hawkins_1c_3	147.8	147.19	286 - 296	SB6, Deeper	Lynwood
SFS_Hawkins_1c_4	147.8	147.18	242 - 252	SB6	Jefferson-Lynwood Aquitard
SFS_Hawkins_1c_5	147.8	147.20	168 - 178	SB5	Hollydale-Jefferson Aquitard

EXPLANATION

msl = mean sea level
bls = below land surface
EPA = U.S. Environmental Protection Agency [hydrostratigraphic]
DWR = California Department of Water Resources [hydrostratigraphic]

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TABLE B-4

PUMPED AND OBSERVATION WELL LOCATIONS

Well Identifier	AREA	LSE (feet msl)	MPE (feet msl)	Screen Interval (feet bls)	HydroUnit		OBSERVATION WELLS	
					EPA	DWR	Same Unit	Same Cluster
NE-1 MWA	NE	TBD	TBD	50 - 100	2/3	Gs	MW-9A and MW-9B	NE-1 MWB, NE-1 MWC, NE-1 MWD
NE-1 MWB	NE	TBD	TBD	120 - 150	3	H	MW-8D	NE-1 MWA, NE-1 MWC, NE-1 MWD
NE-1 MWC	NE	TBD	TBD	160 - 180	4	J	NE-2 MWC	NE-1 MWA, NE-1 MWB, NE-1 MWD
NE-1 MWD	NE	TBD	TBD	200 - 250	5/6	L	NE-2 MWD	NE-1 MWA, NE-1 MWB, NE-1 MWC
NE-2 MWA	NE	TBD	TBD	50 - 90	2	Gs	MW-8A, MW-8B and MW-8C	NE-2 MWB, NE-2 MWC, NE-2 MWD
NE-2 MWB	NE	TBD	TBD	100 - 120	3	H	MW-8D	NE-2 MWA, NE-2 MWC, NE-2 MWD
NE-2 MWC	NE	TBD	TBD	130 - 150	4	J	NE-1 MWC	NE-2 MWA, NE-2 MWB, NE-2 MWD
NE-2 MWD	NE	TBD	TBD	200 - 250	5/6	L	NE-1 MWD	NE-2 MWA, NE-2 MWB, NE-2 MWC
NE-3 MWA	NE	TBD	TBD	50 - 70	2	Ga	MW-10 and MW-25A (if not dry)	NE-3 MWB, NE-3 MWC
NE-3 MWB	NE	TBD	TBD	80 - 100	3	H	MW-25B	NE-3 MWA, NE-3 MWC
NE-3 MWC	NE	TBD	TBD	120 - 140	4	J	NE-2 MWC	NE-3 MWA, NE-3 MWB
CE-1 MWA	CE	TBD	TBD	100 - 120	3/4	WT	CE-2 MWA	CE-1 MWB, CE-1 MWC
CE-1 MWB	CE	TBD	TBD	140 - 170	4	H	CE-2 MWB	CE-1 MWA, CE-1 MWC
CE-1 MWC	CE	TBD	TBD	200 - 250	5/6	J	CE-2 MWC	CE-1 MWA, CE-1 MWB
CE-2 MWA	CE	TBD	TBD	100 - 120	3/4	WT	CE-1 MWA and/or CE-3 MWA	CE-2 MWB, CE-2 MWC
CE-2 MWB	CE	TBD	TBD	140 - 170	4	H	CE-1 MWB and/or CE-3 MWB	CE-2 MWA, CE-2 MWC
CE-2 MWC	CE	TBD	TBD	200 - 250	5/6	J	CE-1 MWC and/or CE-3 MWC	CE-2 MWA, CE-2 MWB
CE-3 MWA	CE	TBD	TBD	100 - 120	3/4	WT	CE-2 MWA	CE-3 MWB, CE-3 MWC
CE-3 MWB	CE	TBD	TBD	140 - 170	5	H	CE-2 MWB	CE-3 MWA, CE-3 MWC
CE-3 MWC	CE	TBD	TBD	200 - 250	6	J	CE-2 MWC	CE-3 MWA, CE-3 MWB
CE-4 MWA	CE	TBD	TBD	100 - 140	4	H	CE-5 MWA	SFS-Hawkins 1c_5 and 1c_4
CE-5 MWA	CE	TBD	TBD	100 - 120	3/4	WT	CE-4 MWA	CE-5 MWB, CE-5 MWC
CE-5 MWB	CE	TBD	TBD	140 - 170	5	H	MW-27B and MW-27C	CE-5 MWA, CE-5 MWC
CE-5 MWC	CE	TBD	TBD	200 - 250	6	J	CE-3 MWC and MW-27D	CE-5 MWA, CE-5 MWB

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TABLE B-4

PUMPED AND OBSERVATION WELL LOCATIONS

Well Identifier	AREA	LSE (feet msl)	MPE (feet msl)	Screen Interval (feet bls)	HydroUnit		OBSERVATION WELLS	
					EPA	DWR	Same Unit	Same Cluster
INJ-1 MWA	PR	TBD	TBD	60 - 120	3	Gs	INJ-2 MWA	Not applicable
INJ-2 MWA	PR	TBD	TBD	60 - 120	3	Gs	INJ-1 MWA and/or INJ-3 MWA	Not applicable
INJ-3 MWA	PR	TBD	TBD	60 - 110	3	Gs	INJ-2 MWA and/or INJ-4 MWA	Not applicable
INJ-4 MWA	PR	TBD	TBD	60 - 100	3	Gs	INJ-3 MWA	Not applicable
CONTINGENCY WELLS								
CINJ-1 MWA	CR	TBD	TBD	100 - 170	3/4	Ga	CINJ-2 MWA	Not applicable
CINJ-2 MWA	CR	TBD	TBD	100 - 150	3/4	Ga	CINJ-1 MWA and/or CINJ-3 MWA	Not applicable
CINJ-3 MWA	CR	TBD	TBD	100 - 110	3/4	Ga	CINJ-2 MWA	Not applicable

AREA EXPLANATION

CE Central Extraction Area
CR Contingency Reinjection Area
NE Northern Extraction Area
PR Primary Reinjection Area

HYDROUNIT EXPLANATION

Gs Gaspur aquifer
Ga Gage aquifer
H Hollydale
J Jefferson aquifer
L Lynwood aquifer
WT Water table (may not be in aquifer)

GENERAL

msl mean sea level
bls below land surface
EPA U.S. Environmental Protection Agency
DWR California Department of Water Resources
LSE Land surface elevation
MPE Measureing point elevation

TABLE B-5

EXISTING EPA AND WRD REMEDIAL DESIGN WORK AREA MONITOR WELLS SUBJECT TO MANUAL WATER LEVEL MEASUREMENT

Well Identifier	Land Surface Elevation feet msl	Measuring Point Elevation feet msl	Screen Interval feet bls	EPA Unit	DWR Unit
MW-1A	157.8	157.71	45 - 60	SB2	Gaspur
MW-1B	158.1	158.05	75 - 85.4	SB2, SB3	Gaspur
MW-2	154.2	154.21	45 - 60	SB2	Gaspur
MW-3	151.9	151.48	38 - 48	SB2	Artesia-Gage Aquitard
MW-4A	147.0	146.80	42.7 - 53	SB2	Gaspur
MW-4B	147.0	146.84	69.7 - 80	SB3	Gaspur
MW-4C	147.4	147.10	88.7 - 99	SB3	Hollydale
MW-5	150.8	150.60	43.3 - 53.3	SB2	Gaspur
MW-6	150.4	150.28	37.1 - 47.5	SB2	Gaspur
MW-7	143.6	143.28	35.8 - 46	SB2, SB3	Gage
MW-8A	150.4	150.14	30 - 45	SB2	Gaspur
MW-8B*	150.3	150.03	65 - 75	SB3	Gaspur
MW-8C	150.3	150.03	86.7 - 91.7	SB3	Gaspur
MW-8D*	150.1	149.91	110 - 120	SB3, SB4	Hollydale
MW-9A	148.9	148.84	25 - 35	SB2	Gaspur
MW-9B	149.1	148.90	49.8 - 60	SB2	Gaspur
MW-10	147.4	147.45	52 - 62	SB3	Gage
MW-11	150.9	150.89	40 - 50	SB3	Gage

TABLE B-5

EXISTING EPA AND WRD REMEDIAL DESIGN WORK AREA MONITOR WELLS SUBJECT TO MANUAL WATER LEVEL MEASUREMENT

Well Identifier	Land Surface Elevation feet msl	Measuring Point Elevation feet msl	Screen Interval feet bls	EPA Unit	DWR Unit
MW-12	220.5	220.87	82 - 97	SB2, SB3	Artesia-Gage Aquitard
MW-13A	206.3	206.02	56 - 66	SB2	Artesia-Gage Aquitard
MW-13B	206.3	205.88	123 - 133	SB3, SB4	Artesia-Gage Aquitard
MW-14	173.0	172.63	60 - 75	SB2	Gaspur
MW-15	148.7	148.28	50 - 70	SB2, SB3	Gaspur
MW-16A	153.5	153.19	45 - 60	SB3	Gage
MW-16B*	153.5	153.19	106 - 116	SB4, SB5	Hollydale
MW-16C	153.5	153.26	149 - 164	SB6	Jefferson-Lynwood Aquitard
MW-17A	159.4	159.03	56 - 71	SB3	Gage, Hollydale
MW-17B*	159.4	158.90	94 - 104	SB4	Hollydale
MW-17C*	159.4	159.00	172 - 182	SB6	Lynwood
MW-18A*	144.3	143.73	56 - 71	SB3, SB4	Hollydale
MW-18B	144.3	143.83	90 - 100	SB5	Hollydale-Jefferson Aquitard
MW-18C*	144.3	143.83	146 - 161	SB6	Jefferson-Lynwood Aquitard
MW-19	159.0	158.73	56 - 71	SB3	Gage
MW-20A	142.1	141.31	75 - 90	SB3	Gage
MW-20B*	142.1	141.32	122 - 132	SB4	Hollydale
MW-20C*	142.1	141.35	180 - 190	SB6	Jefferson
MW-21	129.3	128.81	64 - 79	SB3	Gaspur
MW-22	151.5	150.82	74 - 89	SB3	Gage-Hollydale Aquitard

TABLE B-5

EXISTING EPA AND WRD REMEDIAL DESIGN WORK AREA MONITOR WELLS SUBJECT TO MANUAL WATER LEVEL MEASUREMENT

Well Identifier	Land Surface Elevation feet msl	Measuring Point Elevation feet msl	Screen Interval feet bls	EPA Unit	DWR Unit
MW-23A	149.1	148.76	35 - 55	SB2	Gaspur
MW-23B*	149.4	149.06	82 - 97	SB3	Gaspur
MW-23C*	149.4	149.07	145 - 160	SB5	Jefferson
MW-23D*	149.4	148.04	175 - 185	SB6	Jefferson-Lynwood Aquitard
MW-24A*	162.4	162.04	50 - 70	SB2	Gaspur
MW-24B	162.4	162.03	110 - 125	SB3	Gage-Hollydale Aquitard
MW-24C*	162.4	162.02	140 - 160	SB4, SB5	Jefferson
MW-24D	162.4	162.05	173 - 178	SB6	Lynwood
MW-25A	148.3	147.90	45 - 65	SB3	Gage
MW-25B*	148.3	147.84	90 - 110	SB4, SB5	Hollydale
MW-25C	148.3	147.86	140 - 150	SB6	Jefferson-Lynwood Aquitard
MW-25D*	148.3	147.87	194 - 209	Deep Only	Lynwood
MW-26A*	156.0	155.62	70 - 90	SB3	Hollydale
MW-26B	156.0	155.45	105 - 120	SB4	Hollydale
MW-26C*	156.0	155.41	145 - 160	SB6	Jefferson
MW-26D*	156.0	155.37	185 - 205	SB6	Lynwood
MW-27A*	139.5	139.24	90 - 110	SB3	Gage
MW-27B*	139.5	139.18	144 - 164	SB4	Hollydale
MW-27C*	139.5	139.17	180 - 190	SB5	Hollydale
MW-27D*	139.5	139.13	200 - 210	SB5, SB6	Hollydale-Jefferson Aquitard
MW-31	233.0	232.67	106 - 121	SB3	Artesia-Gage Aquitard
SFS_Hawkins_1a_1*	147.8	147.40	480 - 490	Deep Only	Deep Only
SFS_Hawkins_1b_2*	147.8	147.30	378 - 388	Deep Only	Deep Only
SFS_Hawkins_1c_3*	147.8	147.19	286 - 296	SB6, Deeper	Lynwood
SFS_Hawkins_1c_4*	147.8	147.18	242 - 252	SB6	Jefferson-Lynwood Aquitard
SFS_Hawkins_1c_5*	147.8	147.20	168 - 178	SB5	Hollydale-Jefferson Aquitard

TABLE B-5

EXISTING EPA AND WRD REMEDIAL DESIGN WORK AREA MONITOR WELLS SUBJECT TO MANUAL WATER LEVEL MEASUREMENT

Well Identifier	Land Surface Elevation feet msl	Measuring Point Elevation feet msl	Screen Interval feet bls	EPA Unit	DWR Unit

Note: Water level measurement will be conducted on a quarterly basis in all monitor wells

* A pressure transducer will be installed in this monitor well (See Table B-3). Transducer dataloggers will be downloaded on a quarterly basis, and manual water level measurements will be recorded at the time of download.

msl = mean sea level
bls = below land surface
EPA = U.S. Environmental Protection Agency [hydrostratigraphic]
DWR = California Department of Water Resources [hydrostratigraphic]
WRD = Water Replenishment District of Southern California

TABLE B-6

PRE-DESIGN INVESTIGATION MONITOR WELLS

WELL IDENTIFIER	TARGET INTERVAL	HYDROSTRATIGRAPHIC UNIT(S)
NE-1 MWA	Gaspur Aquifer (may be merged with Gage): first shallow aquifer near water table (50 to 100 feet)	B104: Gaspur aquifer EPA: SB2/Upper portion of SB3
NE-1 MWB	Hollydale Aquifer: next aquifer beneath Gaspur (120 to 150 feet)	B104: Hollydale aquifer EPA: SB3
NE-1 MWC	Jefferson Aquifer: next aquifer beneath Hollydale (160 to 180 feet)	B104: Jefferson aquifer EPA: SB4
NE-1 MWD	Lynwood Aquifer: next aquifer beneath Jefferson (may be as deep as 200 to 250, could be shallower). This is one of two Lynwood monitor wells designed to assess vertical extent of COCs in vicinity of EPA monitor well MW-23D	B104: Lynwood aquifer EPA: SB5/Upper portion of SB6
NE-2 MWA	Gaspur Aquifer (may be merged with Gage): first shallow aquifer near water table (50 to 90 feet)	B104: Gaspur aquifer EPA: SB2
NE-2 MWB	Hollydale Aquifer: next aquifer beneath Gaspur (100 to 120 feet)	B104: Hollydale aquifer EPA: SB3
NE-2 MWC	Jefferson Aquifer: next aquifer beneath Hollydale (130 to 150 feet)	B104: Jefferson aquifer EPA: SB4
NE-2 MWD	Lynwood Aquifer: next aquifer beneath Jefferson (may be as deep as 200 to 250, could be shallower). This is one of two Lynwood monitor wells designed to assess vertical extent of COCs in vicinity of EPA monitor well MW-23D	B104: Lynwood aquifer EPA: SB5/Upper portion of SB6
NE-3 MWA	Gage Aquifer: first shallow aquifer near water table (50 to 70 feet)	B104: Gage aquifer EPA: SB2
NE-3 MWB	Hollydale Aquifer: next aquifer beneath Gage (80 to 100 feet)	B104: Hollydale aquifer EPA: SB3
NE-3 MWC	Jefferson Aquifer: next aquifer beneath Hollydale (120 to 140 feet)	B104: Jefferson aquifer EPA: SB4
CE-1 MWA	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4 (SB3 may be unsaturated)
CE-1 MWB	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB4

TABLE B-6

PRE-DESIGN INVESTIGATION MONITOR WELLS

WELL IDENTIFIER	TARGET INTERVAL	HYDROSTRATIGRAPHIC UNIT(S)
CE-1 MWC	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB5/Upper portion of SB6
CE-2 MWA	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4 (SB3 may be unsaturated)
CE-2 MWB	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB4
CE-2 MWC	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB5/Upper portion of SB6
CE-3 MWA	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4 (SB3 may be unsaturated)
CE-3 MWB	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB5
CE-3 MWC	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB6
CE-4 MWA	Water table to Hollydale (100 to 140 feet)	B104: Hollydale EPA: SB4
CE-5 MWA	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4
CE-5 MWB	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB5
CE-5 MWC	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB6
INJ-1 MWA	Through bottom of Gaspur (60 to 120 feet)	B104: Gaspur EPA: SB3
INJ-2 MWA	Through bottom of Gaspur (60 to 120 feet)	B104: Gaspur EPA: SB3
INJ-3 MWA	Through bottom of Gaspur (60 to 110 feet)	B104: Gaspur EPA: SB3

TABLE B-6

PRE-DESIGN INVESTIGATION MONITOR WELLS

WELL IDENTIFIER	TARGET INTERVAL	HYDROSTRATIGRAPHIC UNIT(S)
INJ-4 MWA	Through bottom of Gaspur (60 to 100 feet)	B104: Gaspur EPA: SB3
CINJ-1 MWA	Through bottom of Gage (100 to 170 feet)	B104: Gage EPA: SB3/SB4
CINJ-2 MWA	Through bottom of Gage (100 to 150 feet)	B104: Gage EPA: SB3/SB4
CINJ-3 MWA	Through bottom of Gage (100 to 110 feet)	B104: Gage EPA: SB3/SB4

NOTE: Following well installation and development, a pressure transducer will be installed in each of these monitor wells. Transducer dataloggers will be downloaded on a quarterly basis, and manual water level measurements will be recorded at the time of download.

TABLE B-7

ANALYTES, ANALYTICAL METHOD AND REPORTING LIMITS

Constituent Group	Analyte Group	Compound/Constituent	CAS	Analytical Method	Screening Level Concentration[1]	Reporting Units	Reporting Limit	Reporting Limit Source	SAMPLE GROUP
COCs	VOCs (Main COCs and/or RI COPCs)	Trichloroethylene (TCE)	79-01-6	EPA 8260B[2]	5	µg/L	0.5	CA DDW DLR	COCs, Moderate List, and Long List
		Tetrachloroethylene (PCE)	127-18-4	EPA 8260B[2]	5	µg/L	0.5	CA DDW DLR	
		Trichlorofluoroethane (FREON 11)	75-69-4	EPA 8260B[2]	150	µg/L	5	CA DDW DLR	
		Trichlorotrifluoroethane (FREON 113)	76-13-1	EPA 8260B[2]	1200	µg/L	10	CA DDW DLR	
		1,1-Dichloroethylene (1,1-DCE)	75-35-4	EPA 8260B[2]	6	µg/L	0.5	CA DDW DLR	
		cis-1,2-Dichloroethylene (c-1,2-DCE)	156-59-2	EPA 8260B[2]	6	µg/L	0.5	CA DDW DLR	
		Chloroform (Trichloromethane)	67-66-3	EPA 8260B[2]	80	µg/L	1	CA DDW DLR	
		Carbon tetrachloride	56-23-5	EPA 8260B[2]	0.5	µg/L	0.5	CA DDW DLR	
		1,1-Dichloroethane (1,1-DCA)	75-34-3	EPA 8260B[2]	5	µg/L	0.5	CA DDW DLR	
		1,2-Dichloroethane (1,2-DCA)	107-06-2	EPA 8260B[2]	0.5	µg/L	0.5	CA DDW DLR	
		1,1,1-Trichloroethane (1,1,1-TCA)	71-55-6	EPA 8260B[2]	200	µg/L	0.5	CA DDW DLR	
		1,1,2,2-Tetrachloroethane	79-34-5	EPA 8260B[2]	1	µg/L	0.5	CA DDW DLR	
		Dibromochloropropane (DBCP)[c]	96-12-6	EPA 504.1[3]	0.2	µg/L	0.01	CA DDW DLR	
		Ethylene Dibromide (EDB)[c]	106-93-4	EPA 504.1[3]	0.05	µg/L	0.02	CA DDW DLR	
		Benzene	71-43-2	EPA 8260B[2]	1	µg/L	0.5	CA DDW DLR	
		Carbon disulfide[d]	75-15-0	EPA 8260B[2]	160	µg/L	0.5	CA DDW DLR	
		Monochlorobenzene (Chlorobenzene)	108-90-7	EPA 8260B[2]	70	µg/L	0.5	CA DDW DLR	
		cis-1,3-Dichloropropene	10061-01-5	EPA 8260B[2]	0.5	µg/L	0.5	CA DDW DLR	
		Methyl tert-Butyl Ether (MTBE)	1634-04-4	EPA 8260B[2]	13	µg/L	3	CA DDW DLR	
		Dichloromethane (Methylene Chloride)[d]	75-09-2	EPA 8260B[2]	5	µg/L	0.5	CA DDW DLR	
		Toluene	108-88-3	EPA 8260B[2]	150	µg/L	0.5	CA DDW DLR	
		trans-1,2-Dichloroethylene (t-1,2-DCE)	156-60-5	EPA 8260B[2]	10	µg/L	0.5	CA DDW DLR	
		trans-1,3-dichloropropene	10061-02-6	EPA 8260B[2]	0.5	µg/L	0.5	CA DDW DLR	
		Vinyl Chloride (VC)	75-01-4	EPA 8260B[2]	0.5	µg/L	0.5	CA DDW DLR	
	Emergent Compounds	1,4-Dioxane	123-91-1	EPA 8270C SIM	1	µg/L	1	CA DDW DLR	
		Chromium, hexavalent (CrVI)	18540-29-9	EPA 218.6	10	ug/L	1	CA DDW DLR	
Key Treatment Constituents	SVOCs	Bis (2-Ethylhexyl)phthalate	117-81-7	EPA 525.2	4	µg/L	3	CA DDW DLR	Moderate List and Long List
	General Mineral	Aluminum (Al)	7429-90-5	EPA 200.8	50	ug/L	50	CA DDW DLR	
		Manganese (Mn)	7439-96-5	EPA 200.8	50	ug/L	20	CA DDW DLR	
		Selenium (Se)	7782-49-2	EPA 200.8	50	ug/L	5	CA DDW DLR	
		Chromium (Total Cr)	7440-47-3	EPA 200.8	50	ug/L	10	CA DDW DLR	
		Sulfate (SO4)	14808-79-8	EPA 300.0	250	mg/L	0.5	CA DDW DLR	
		Nitrate as Nitrogen (N)	14797-55-8	EPA 300.0	10	mg/L	0.4	CA DDW DLR	
		Total Dissolved Solids (TDS)	10-33-3	SM 2540 C	700	mg/L			
	Emergent Compounds	Perchlorate	14797-73-0	314.0 or 331.0	6	ug/L	4	CA DDW DLR	
General Chemistry[a]	General Mineral	Antimony	7440-36-0	EPA 200.8	6	ug/L	6	CA DDW DLR	Moderate List and Long List (continued)
		Arsenic	7440-38-2	EPA 200.8	10	ug/L	2	CA DDW DLR	
		Barium (Ba)	7440-39-3	EPA 200.8	1000	ug/L	100	CA DDW DLR	
		Beryllium	7440-41-7	EPA 200.8	4	ug/L	1	CA DDW DLR	
		Cadmium (Cd)	7440-43-9	EPA 200.8	5	ug/L	1	CA DDW DLR	
		Cobalt	7440-48-4	EPA 200.8		ug/L	(b)		
		Copper (Cu)	7440-50-8	EPA 200.8	1000	ug/L	50	CA DDW DLR	
		Iron (Fe)	7439-89-6	EPA 200.8	300	ug/L	100	CA DDW DLR	
		Lead (Pb)	7439-92-1	EPA 200.8	15	ug/L	5	CA DDW DLR	
		Molybdenum	7439-98-7	EPA 200.8		ug/L	(b)		
		Mercury (Hg)	7439-97-6	Epa 245.1	2	ug/L	1	CA DDW DLR	
		Nickel	7440-02-0	EPA 200.8	100	ug/L	10	CA DDW DLR	
		Silver (Ag)	7440-22-4	EPA 200.8	100	ug/L	10	CA DDW DLR	
		Thallium	7440-28-0	EPA 200.8	2	ug/L	1	CA DDW DLR	
		Vanadium	7440-62-2	EPA 200.8	50	ug/L	3	CA DDW DLR	
		Zinc (Zn)	7440-66-6	EPA 200.8	5000	ug/L	50	CA DDW DLR	
		Chloride	16887-00-6	EPA 300.0	150	mg/L	(b)		
		Alkalinity, (Total) (as CaCO3 equivalents)	TOT-ALK	SM 2320B		mg/L	(b)		
		Bicarbonate (as HCO3)	71-52-3	SM 2320B		mg/L	(b)		
		Calcium (Ca)	7440-70-2	EPA 200.7		mg/L	(b)		
		Sodium (Na)		EPA 200.7		mg/L	(b)		
		Potassium (K)	7440-09-7	EPA 200.7		mg/L	(b)		
		Magnesium (Mg)	7439-95-4	EPA 200.7		mg/L	(b)		
		Fluoride (F) (Natural-Source)	16984-48-8	EPA 300.0	2	mg/L	0.1	CA DDW DLR	
		Boron	7440-42-8	EPA 200.7	1000	ug/L	100	CA DDW DLR	
		Silica	7631-86-9	EPA 200.7		mg/L	(b)		
		Phosphate (as PO4)	PO4	EPA 365.1		mg/L	(b)		
		Ammonia	NH3	EPA 350.1		mg/L	(b)		
Treatment System[a]	General Mineral	Uranium	7440-61-1	EPA 200.8		ug/L	1	CA DDW DLR	
		Strontium	7440-24-6	EPA 200.8		ug/l	(b)		
Emergent Compounds[a]		n-Nitrosodimethylamine (NDMA)	10595-95-6	EPA 1625C	0.01	µg/L	0.01	Screening level	
		1,2,3-Trichloropropane	96-18-4	SRL 524M-TCP	0.005	µg/L	0.005	CA DDW DLR	
Other Permitting[a]	VOCs	1,1,2-Trichloroethane (1,1,2-TCA)	79-00-5	EPA 524.2	5	µg/L	0.5	CA DDW DLR	Long List
		1,2-Dichlorobenzene (o-DCB)	95-50-1	EPA 524.2	600	µg/L	0.5	CA DDW DLR	
		1,2-Dichloropropane	78-87-5	EPA 524.2	5	µg/L	0.5	CA DDW DLR	
		1,3-Dichlorobenzene (m-DCB)	541-73-1	EPA 524.2		µg/L	0.5	CA DDW DLR	
		1,3-Dichloropropene, Total	542-75-6	EPA 524.2	0.5	µg/L	0.5	CA DDW DLR	
		1,4-Dichlorobenzene (p-DCB)	106-46-7	EPA 524.2	5	µg/L	0.5	CA DDW DLR	
		2-Chloroethylvinyl Ether	110-75-8	EPA 524.2		µg/L	1	RWQCB, E	
		Acetone	67-64-1	EPA 524.2		µg/L	(b)		

TABLE B-7

ANALYTES, ANALYTICAL METHOD AND REPORTING LIMITS

Constituent Group	Analyte Group	Compound/Constituent	CAS	Analytical Method	Screening Level Concentration[1]	Reporting Units	Reporting Limit	Reporting Limit Source	SAMPLE GROUP
Other Permitting[a]	VOCs	Acrolein	107-02-8	EPA 524.2		ug/l	5	RWQCB, E	Long List
		Acrylonitrile (Acritet)	107-13-1	EPA 524.2		µg/L	2	RWQCB, E	
		Bromoform	75-25-2	EPA 524.2		µg/L	0.5	RWQCB, E	
		Dibromochloromethane	124-48-1	EPA 524.2		µg/L	0.5	RWQCB, E	
		Chloroethane	75-00-3	EPA 524.2		µg/L	0.5	CA DDW DLR	
		Bromodichloromethane	75-27-4	EPA 524.2		µg/L	0.5	RWQCB, E	
		Ethyl Benzene	100-41-4	EPA 524.2	300	µg/L	0.5	CA DDW DLR	
		Bromomethane (Methyl Bromide)	74-83-9	EPA 524.2		µg/L	0.5	CA DDW DLR	
		Chloromethane (Methyl Chloride)	74-87-3	EPA 524.2		µg/L	0.5	CA DDW DLR	
		Diisopropyl Ether (DIPE)	108-20-3	EPA 524.2		µg/L	2	RWQCB, E	
		Methyl Ethyl Ketone (MEK, Butanone)	78-93-3	EPA 524.2		µg/L	5	CA DDW DLR	
		tert-Amyl Methyl Ether (TAME)	994-05-8	EPA 524.2		µg/L	2	RWQCB, E	
		tert-Butyl Alcohol (TBA)	75-65-0	EPA 524.2	12	µg/L	2	CA DDW DLR	
		Styrene	100-42-5	EPA 524.2	100	µg/L	0.5	CA DDW DLR	
		m,p-Xylene	179601-23-1	EPA 524.2		µg/L	0.5	CA DDW DLR	
		Total Xylenes (m,p, & o)	1330-20-7	EPA 524.2	1750	µg/L	(b)		
	General Mineral	Asbestos	1332-21-4	EPA 100.1/100.2	7	MFL	0.2	CA DDW DLR	
		Chemical oxygen demand	--	410.4			(b)		
		pH	12408-02-5	SM 4500 H+B (or field)		Std Units	(b)		
		Oxidation-reduction potential	--	ASTM D 1498 (or field)			(b)		
		Dissolved oxygen	--	SM 4500 O G (or field)			(b)		
		Carbon Dioxide	124-38-9	RSK-175		ug/L	(b)		
		Nitrate + Nitrite as Nitrogen (N)	NO3NO2	300.0	10	mg/L	0.4	CA DDW DLR	
		Combined Radium-226 and Radium-228	7440-14-4	EPA 903.0, Ra-05	5	pCi/L	1	CA DDW DLR	
		Gross Alpha	12587-46-1	EPA 900.0	15	pCi/L	3	CA DDW DLR	
		Tritium	10028-17-8	EPA 906.0	20000	pCi/L	1000	CA DDW DLR	
		Strontium – 90	10098-97-2	EPA 905.0	8	pCi/L	2	CA DDW DLR	
		Gross Beta	12587-47-2	EPA 900.0	50	pCi/L	4	CA DDW DLR	
		Uranium	7440-61-1	EPA 200.8	20	pCi/L	1	CA DDW DLR	
	Misc	Total petroleum hydrocarbons	--	EPA 8015B			(b)		
		Biochemical oxygen demand	--	SM5210B			(b)		
		Methane	74-82-8	RSK-175			(b)		
		Temperature	--	Field Measurement			(b)		
		Coliform[f]	--	SM 9221B	1.1	MPN/100ml	(b)		
		Ethanol	64-17-5	EPA 8015B		µg/L	1000	RWQCB, E	
		Methanol	67-56-1	EPA 8015B		µg/L	1000	RWQCB, E	
		Cyanide	57-12-5	SM 4500 CN E	150	ug/L	5	RWQCB, E	
		2,3,7,8-TCDD (Dioxin)	1746-01-6	EPA 1613B	30	pg/L	5	CA DDW DLR	
	Pesticides and PCBs	4,4'-DDD	72-54-8	EPA 608, LL		µg/L	0.02	CA DDW DLR	
		4,4'-DDE	72-55-9	EPA 608, LL		µg/L	0.01	CA DDW DLR	
		4,4'-DDT	50-29-3	EPA 608, LL		µg/L	0.01	RWQCB, E	
		Endosulfan I	959-98-8	EPA 608, LL		µg/L	0.01	CA DDW DLR	
		alpha-BHC	319-84-6	EPA 608, LL		µg/L	0.01	CA DDW DLR	
		Aldrin	309-00-2	EPA 608, LL		µg/L	0.005	RWQCB, E	
		Endosulfan II	33213-65-9	EPA 608, LL		µg/L	0.01	CA DDW DLR	
		beta-BHC	319-85-7	EPA 608, LL		µg/L	0.005	RWQCB, E	
		Chlordane	57-74-9	EPA 608, LL	0.1	µg/L	0.1	CA DDW DLR	
		delta-BHC	319-86-8	EPA 608, LL		µg/L	0.005	RWQCB, E	
		Dieldrin	60-57-1	EPA 608, LL		µg/L	0.01	RWQCB, E	
		Endosulfan Sulfate	1031-07-8	EPA 608, LL		µg/L	0.05	CA DDW DLR	
		Endrin	72-20-8	EPA 608, LL	2	µg/L	0.01	RWQCB, E	
		Endrin Aldehyde	7421-93-4	EPA 608, LL		µg/L	0.01	RWQCB, E	
		Heptachlor	76-44-8	EPA 608, LL	0.01	µg/L	0.01	CA DDW DLR	
		Heptachlor Epoxide	1024-57-3	EPA 608, LL	0.01	µg/L	0.01	CA DDW DLR	
		gamma-BHC	58-89-9	EPA 608, LL	0.2	µg/L	0.02	RWQCB, E	
		PCB-1016 (as decachlorobiphenyl (DCB))	12674-11-2	EPA 608, LL		µg/L	0.5	CA DDW DLR	
		PCB-1221 (as DCB)	11104-28-2	EPA 608, LL		µg/L	0.5	CA DDW DLR	
		PCB-1232 (as DCB)	11141-16-5	EPA 608, LL		µg/L	0.5	CA DDW DLR	
		PCB-1242 (as DCB)	53469-21-9	EPA 608, LL		µg/L	0.5	CA DDW DLR	
		PCB-1248 (as DCB)	12672-29-6	EPA 608, LL		µg/L	0.5	CA DDW DLR	
		PCB-1254 (as DCB)	11097-69-1	EPA 608, LL		µg/L	0.5	CA DDW DLR	
		PCB-1260 (as DCB)	11096-82-5	EPA 608, LL		µg/L	0.5	CA DDW DLR	
		Toxaphene	8001-35-2	EPA 608, LL	3	µg/L	0.5	RWQCB, E	
	SVOCs	1,2-Diphenylhydrazine	122-66-7	EPA 625 SIM		µg/L	(b)		
		1,2,4-Trichlorobenzene	120-82-1	EPA 625 SIM	5	µg/L	0.5	CA DDW DLR	
		2-Chlorophenol	95-57-8	EPA 625 SIM		µg/L	5	CA DDW DLR	
		2,4-Dichlorophenol	120-83-2	EPA 625 SIM		µg/L	5	CA DDW DLR	
		2,4-Dimethylphenol	105-67-9	EPA 625 SIM		µg/L	2	RWQCB, E	
		2,4-Dinitrophenol	51-28-5	EPA 625 SIM		µg/L	5	CA DDW DLR	
		2,4-Dinitrotoluene	121-14-2	EPA 625 SIM		µg/L	5	CA DDW DLR	
		2,4,6-Trichlorophenol	88-06-2	EPA 625 SIM		µg/L	5	CA DDW DLR	
		2,6-Dinitrotoluene	606-20-2	EPA 625 SIM		µg/L	5	CA DDW DLR	
		2-Nitrophenol	88-75-5	EPA 625 SIM		µg/L	5	CA DDW DLR	
		2-Chloronaphthalene	91-58-7	EPA 625 SIM		µg/L	5	CA DDW DLR	
		3,3-Dichlorobenzidine	91-94-1	EPA 625 SIM		µg/L	5	RWQCB, E	

TABLE B-7

ANALYTES, ANALYTICAL METHOD AND REPORTING LIMITS

Constituent Group	Analyte Group	Compound/Constituent	CAS	Analytical Method	Screening Level Concentration[1]	Reporting Units	Reporting Limit	Reporting Limit Source	SAMPLE GROUP
Other Permitting[a] (Continued)	SVOCs	4-Chloro-3-Methylphenol[f]	59-50-7	EPA 625 SIM		µg/L	1	RWQCB, E	Long List (continued)
		2-Methyl-4,6-Dinitrophenol	534-52-1	EPA 625 SIM		µg/L	5	CA DDW DLR	
		4-Nitrophenol	100-02-7	EPA 625 SIM		µg/L	5	CA DDW DLR	
		4-Bromophenyl Phenyl Ether	101-55-3	EPA 625 SIM		µg/L	5	CA DDW DLR	
		4-Chlorophenyl phenyl Ether	7005-72-3	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Acenaphthene	83-32-9	EPA 625 SIM		µg/L	1	RWQCB, E	
		Acenaphthylene	208-96-8	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Anthracene	120-12-7	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Benzidine	92-87-5	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Benzo (a) Anthracene	56-55-3	EPA 625 SIM		µg/L	5	RWQCB, E	
		Benzo(a)pyrene	50-32-8	EPA 625 SIM	0.2	µg/L	0.1	CA DDW DLR	
		Benzo (b) Fluoranthene	205-99-2	EPA 625 SIM		µg/L	10	CA DDW DLR	
		Benzo (ghi) Perylene	191-24-2	EPA 625 SIM		µg/L	5	RWQCB, E	
		Benzo (k) Fluoranthene	207-08-9	EPA 625 SIM		µg/L	2	RWQCB, E	
		bis (2-Chloroethoxy) methane	111-91-1	EPA 625 SIM		µg/L	5	CA DDW DLR	
		bis (2-Chloroethyl) Ether	111-44-4	EPA 625 SIM		µg/L	(b)		
		bis (2-Chloroisopropyl) Ether	108-60-1	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Benzyl Butyl Phthalate	85-68-7	EPA 625 SIM		µg/L	10	CA DDW DLR	
		Chrysene	218-01-9	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Dibenzo (a,h) anthracene	53-70-3	EPA 625 SIM		µg/L	0.1	RWQCB, E	
		Diethylphthalate	84-66-2	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Dimethyl phthalate	131-11-3	EPA 625 SIM		µg/L	5	CA DDW DLR	
		di-n-Butylphthalate	84-74-2	EPA 625 SIM		µg/L	5	CA DDW DLR	
		di-n-Octylphthalate	117-84-0	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Fluoranthene	206-44-0	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Fluorene	86-73-7	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Hexachlorobenzene	118-74-1	EPA 625 SIM	1	µg/L	0.5	CA DDW DLR	
		Hexachlorobutadiene	87-68-3	EPA 625 SIM		µg/L	0.5	CA DDW DLR	
		Hexachlorocyclopentadiene	77-47-4	EPA 625 SIM	50	µg/L	1	CA DDW DLR	
		Hexachloroethane	67-72-1	EPA 625 SIM		µg/L	1	RWQCB, E	
		Indeno (1,2,3-cd) Pyrene	193-39-5	EPA 625 SIM		µg/L	0.05	RWQCB, E	
		Isophorone	78-59-1	EPA 625 SIM		µg/L	1	RWQCB, E	
		N-Nitrosodi-n-propylamine (NDPA)[f]	621-64-7	EPA 625 SIM	0.01	µg/L	(b)		
		N-Nitrosodiphenylamine	86-30-6	EPA 625 SIM		µg/L	(b)		
		Naphthalene	91-20-3	EPA 625 SIM	17	µg/L	0.5	CA DDW DLR	
		Nitrobenzene	98-95-3	EPA 625 SIM		µg/L	(b)		
		Pentachlorophenol (PCP)	87-86-5	EPA 515.3	1	µg/L	0.2	CA DDW DLR	
		Phenanthrene	85-01-8	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Phenol (Carbolic Acid)	108-95-2	EPA 625 SIM		µg/L	5	CA DDW DLR	
		Pyrene	129-00-0	EPA 625 SIM		µg/L	5	CA DDW DLR	
	Herbicides	Alachlor (ALANEX) (also UCMR 2 Monitoring-TM 525.2)	15972-60-8	EPA 525.2	2	µg/L	1	CA DDW DLR	
		Atrazine (AATREX)	1912-24-9	EPA 525.2	1	µg/L	0.5	CA DDW DLR	
		Bentazon (BASAGRAN)	25057-89-0	EPA 515.3	18	µg/L	2	CA DDW DLR	
		Carbofuran (FURADAN)	1563-66-2	EPA 531.1	18	µg/L	5	CA DDW DLR	
		2,4-D	94-75-7	EPA 515.3	70	µg/L	10	CA DDW DLR	
		Dalapon	75-99-0	EPA 515.3	200	µg/L	10	CA DDW DLR	
		Di(2-ethylhexyl) Adipate	103-23-1	EPA 525.2	400	µg/L	5	CA DDW DLR	

NOTES:

- Waste Discharge Requirements (WDR) Permit Only
- National Pollutant Discharge Elimination System (NPDES) Permit Only
- Both NPDES and WDR Permits

[1] Pursuant to RWQCB-LA WDR Order No. R4-2014-0187: Treated groundwater that exhibits general mineral content that is naturally occurring and exceeds Basin Plan Objectives may be returned to the same groundwater aquifers from which it is withdrawn, with concentrations not exceeding the original background concentrations for the site

[2] EPA Method 8260B will be used to analyze VOCs for COC sampling events. The laboratory reporting level for VOCs in 8260B scan may not meet CA DDW DLRs; however, they will be equal to or below screening levels with exception of those constituents indicated with "c" or "d". EPA Method 524.2 will be used for moderate and long list events.

[3] These compounds will be analyzed using EPA Methods 8260B during COC events; using 524.4 during moderate list events; and using EPA Method 504.1 during long list events.

[a] Does not include compounds or constituents that are listed in above categories

[b] Standard methods and detection limits apply

[c] This compound will be analyzed using EPA Method 504.1 for Long List sampling when CA DDW DLR levels required; otherwise, analysis will be by EPA Method 8260B

[d] Method detection limits for 8260B above CA DDW DLR levels; however, below screening levels.

[f] Detections below the reporting limit will be indicated by a "J" flag, if applicable. However, lowest screening level is below Method Detection Limit achievable by lab

-- Not applicable

COC	Chemical of concern	MPN/100ml	Most Probable Number per 100 milliliters
COPC	Chemical of potential concern (RI)	ug/l	Micrograms per liter
RI	Remedial Investigation Report	pg/l	Picograms per liter
VOC	Volatile organic compound	pCi/L	picocuries per liter
SVOC	Semivolatile organic compound	mg/l	milligrams per liter
misc	Miscelllaneous	MFL	Million fibers per liter
PCBs	Polychlorinated Biphenyls		

CA DDW DLR California State Water Resources Control Board, Division of Drinking Water, detection limit for purposes of reporting based on drinking water standards and best available analytical methods

RWQCB, E California Regional Water Quality Control Board, Los Angeles Region. Appendix E reporting limit for NPDES permit.

TABLE B-8

PRE-DESIGN INVESTIGATION EXPLORATORY BOREHOLE AND MONITOR WELL SUMMARY

LOCATION	ID	FEATURE	TARGET INTERVAL	HYDROSTRATIGRAPHIC UNITS	DECISION CRITERIA FOR ADDITIONAL INVESTIGATION
Slauson Avenue west side of OU2	NE-1 EB	Exploratory Borehole	Through bottom of Lynwood / EPA SB6 (375 feet, bottom of EPA SB6 deeper than bottom of Lynwood)	B104: Gaspur (Gage may be merged with Gaspur or eroded off); Hollydale; Jefferson and Lynwood aquifers EPA: SB2 to SB6	No additional exploratory boreholes to east as existing/new monitor well coverage is adequate, no additional investigation to west given proximity of western edge of OU2. Potential deeper exploratory boring installation if deepest monitor well average COC concentration exceeds MCL (or NL for 1,4-dioxane) and existing lithologic information from original exploratory borehole not deep enough to design deeper monitor well.
	NE-1 MWA	Monitor Well	Gaspur Aquifer (may be merged with Gage): first shallow aquifer near water table (50 to 100 feet)	B104: Gaspur aquifer EPA: SB2/Upper portion of SB3	No additional monitor wells to east as additional coverage with new/existing wells is adequate, no additional investigation to west given proximity of western edge of OU2. No additional deeper monitor wells as new Hollydale monitor well in cluster provides vertical control.
	NE-1 MWB	Monitor Well	Hollydale Aquifer: next aquifer beneath Gaspur (120 to 150 feet)	B104: Hollydale aquifer EPA: SB3	No additional monitor wells to east as additional coverage with new/existing wells is adequate, no additional investigation to west given proximity of western edge of OU2. No additional deeper monitor wells as new Jefferson monitor well in cluster provides vertical control.
	NE-1 MWC	Monitor Well	Jefferson Aquifer: next aquifer beneath Hollydale (160 to 180 feet)	B104: Jefferson aquifer EPA: SB4	No additional monitor wells to east as additional coverage with new/existing wells is adequate, no additional investigation to west given proximity of western edge of OU2. No additional deeper monitor wells as new Lynwood monitor well in cluster provides vertical control.
	NE-1 MWD	Monitor Well	Lynwood Aquifer: next aquifer beneath Jefferson (may be as deep as 200 to 250, could be shallower). This is one of two Lynwood monitor wells designed to assess vertical extent of COCs in vicinity of EPA monitor well MW-23D	B104: Lynwood aquifer EPA: SB5/Upper portion of SB6	No additional monitor wells to east as additional coverage with new/existing wells is adequate, no additional investigation to west given proximity of western edge of OU2. Potential contingency deeper monitor well in deeper interval(s) if average of Lynwood monitor well results for COCs exceeds MCL (or NL in case of 1,4-dioxane). If deeper contingency monitor well(s) indicates average concentrations of COCs exceeds MCL (or NL in case of 1,4-dioxane), additional contingency deeper monitor wells may be required vertically.
Sorensen Avenue near Baker Place	NE-2 EB	Exploratory Borehole	Through bottom of Lynwood / EPA SB6 (375 feet, bottom of EPA SB6 deeper than bottom of Lynwood)	B104: Gaspur (Gage may be merged with Gaspur or eroded off); Hollydale; Jefferson and Lynwood aquifers EPA: SB2 to SB6	No additional exploratory boreholes to east or west as the coverage with existing/new wells is adequate. Potential deeper exploratory boring installation if deepest monitor well average COC concentration exceeds MCL or NL and existing lithologic information from original exploratory borehole not deep enough to design deeper monitor well.
	NE-2 MWA	Monitor Well	Gaspur Aquifer (may be merged with Gage): first shallow aquifer near water table (50 to 90 feet)	B104: Gaspur aquifer EPA: SB2	No additional monitor wells to east or west as additional coverage with new/existing wells is adequate. No additional deeper monitor wells as new Hollydale monitor well in cluster provides vertical control.
	NE-2 MWB	Monitor Well	Hollydale Aquifer: next aquifer beneath Gaspur (100 to 120 feet)	B104: Hollydale aquifer EPA: SB3	No additional monitor wells to east or west as additional coverage with new/existing wells is adequate. No additional deeper monitor wells as new Jefferson monitor well in cluster provides vertical control.
	NE-2 MWC	Monitor Well	Jefferson Aquifer: next aquifer beneath Hollydale (130 to 150 feet)	B104: Jefferson aquifer EPA: SB4	No additional monitor wells to east or west as additional coverage with new/existing wells is adequate. No additional deeper monitor wells as new Lynwood monitor well in cluster provides vertical control.
	NE-2 MWD	Monitor Well	Lynwood Aquifer: next aquifer beneath Jefferson (may be as deep as 200 to 250, could be shallower). This is one of two Lynwood monitor wells designed to assess vertical extent of COCs in vicinity of EPA monitor well MW-23D	B104: Lynwood aquifer EPA: SB5/Upper portion of SB6	No additional monitor wells to east or west as additional coverage with new/existing wells is adequate. Potential contingency deeper monitor well in deeper interval(s) if average of Lynwood monitor well results for COCs exceeds MCL or NL. If deeper contingency monitor well(s) indicates concentrations of COCs exceeds MCL or NL, additional contingency deeper monitor wells may be required vertically.

TABLE B-8

PRE-DESIGN INVESTIGATION EXPLORATORY BOREHOLE AND MONITOR WELL SUMMARY

LOCATION	ID	FEATURE	TARGET INTERVAL	HYDROSTRATIGRAPHIC UNITS	DECISION CRITERIA FOR ADDITIONAL INVESTIGATION
Sorensen Avenue to west of John Street	NE-3 EB	Exploratory Borehole	Through bottom of Lynwood / EPA SB6 (300 feet, bottom of EPA SB6 deeper than bottom of Lynwood)	B104: Gage; Hollydale; Jefferson and Lynwood aquifers (Gaspur not present or unsaturated) EPA: SB2 to SB6	No additional exploratory boreholes to east or west as the coverage with existing/new wells is adequate. Potential deeper exploratory boring installation if deepest monitor well average COC concentration exceeds MCL or NL and existing lithologic information from original exploratory borehole not deep enough to design deeper monitor well.
	NE-3 MWA	Monitor Well	Gage Aquifer: first shallow aquifer near water table (50 to 70 feet)	B104: Gage aquifer EPA: SB2	No additional monitor wells to east or west as additional coverage with new/existing wells is adequate. No additional deeper monitor wells as new Hollydale monitor well in cluster provides vertical control.
	NE-3 MWB	Monitor Well	Hollydale Aquifer: next aquifer beneath Gage (80 to 100 feet)	B104: Hollydale aquifer EPA: SB3	No additional monitor wells to east or west as additional coverage with new/existing wells is adequate. No additional deeper monitor wells as new Jefferson monitor well in cluster provides vertical control.
	NE-3 MWC	Monitor Well	Jefferson Aquifer: next aquifer beneath Hollydale (120 to 140 feet)	B104: Jefferson aquifer EPA: SB4	No additional monitor wells to east or west as additional coverage with new/existing wells is adequate. Potential contingency deeper monitor well in Lynwood if average of Jefferson monitor well results for COCs exceeds MCL or NL. If deeper contingency monitor well(s) indicates concentrations of COCs exceeds MCL or NL, additional contingency deeper monitor wells may be required vertically.
Telegraph Road on west side of OU2	CE-1 EB	Exploratory Borehole	Through bottom of Lynwood / EPA SB6 (425 feet, bottom of EPA SB6 deeper than bottom of Lynwood)	B104: Gage (may be unsaturated); Hollydale; Jefferson and Lynwood aquifers (Gaspur not unsaturated; Artesia not present) EPA: SB3 to SB6	No additional exploratory boreholes to east as the coverage with existing/new wells is adequate, no additional investigation to west given proximity of western edge of OU2. Potential deeper exploratory boring installation if deepest monitor well average COC concentration exceeds MCL or NL and existing lithologic information from original exploratory borehole not deep enough to design deeper monitor well.
	CE-1 MWA	Monitor Well	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4 (SB3 may be unsaturated)	No additional monitor wells to east as additional coverage with new/existing wells is adequate, no additional investigation to west given proximity of western edge OU2. No additional deeper monitor wells as new Hollydale monitor well in cluster provides vertical control.
	CE-1 MWB	Monitor Well	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB4	No additional monitor wells to east as additional coverage with new/existing wells is adequate, no additional investigation to west given proximity of western edge of OU2. No additional deeper monitor wells as new Jefferson monitor well in cluster provides vertical control.
	CE-1 MWC	Monitor Well	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB5/Upper portion of SB6	No additional monitor wells to east as additional coverage with new/existing wells is adequate, no additional investigation to west given proximity of western edge OU2. Potential contingency deeper monitor well in Lynwood if average of Jefferson monitor well results for COCs exceeds MCL or NL. If deeper contingency monitor well(s) indicates concentrations of COCs exceeds MCL or NL, additional contingency deeper monitor wells may be required vertically.
Telegraph Road to west of Matern Place	CE-2 EB	Exploratory Borehole	Through bottom of Lynwood / EPA SB6 (400 feet, bottom of EPA SB6 deeper than bottom of Lynwood)	B104: Gage (may be unsaturated); Hollydale; Jefferson and Lynwood aquifers (Gaspur not unsaturated; Artesia not present) EPA: SB3 to SB6	No additional exploratory boreholes to east or west as the coverage with existing/new wells is adequate. Potential deeper exploratory boring installation if deepest monitor well average COC concentration exceeds MCL or NL and existing lithologic information from original exploratory borehole not deep enough to design deeper monitor well.
	CE-2 MWA	Monitor Well	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4 (SB3 may be unsaturated)	No additional monitor wells to east or west as the coverage with existing/new wells is adequate. No additional deeper monitor wells as new Hollydale monitor well in cluster provides vertical control.
	CE-2 MWB	Monitor Well	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB4	No additional monitor wells to east or west as the coverage with existing/new wells is adequate. No additional deeper monitor wells as new Jefferson monitor well in cluster provides vertical control.
	CE-2 MWC	Monitor Well	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB5/Upper portion of SB6	No additional monitor wells to east or west as the coverage with existing/new wells is adequate. Potential contingency deeper monitor well in Lynwood if average of Jefferson monitor well results for COCs exceeds MCL or NL. If deeper contingency monitor well(s) indicates concentrations of COCs exceeds MCL or NL, additional contingency deeper monitor wells may be required vertically.

TABLE B-8

PRE-DESIGN INVESTIGATION EXPLORATORY BOREHOLE AND MONITOR WELL SUMMARY

LOCATION	ID	FEATURE	TARGET INTERVAL	HYDROSTRATIGRAPHIC UNITS	DECISION CRITERIA FOR ADDITIONAL INVESTIGATION
Telegraph Road near Matern Place	CE-3 EB	Exploratory Borehole	Through bottom of Lynwood / EPA SB6 (375 feet, bottom of EPA SB6 deeper than bottom of Lynwood)	B104: Gage (may be unsaturated); Hollydale; Jefferson and Lynwood aquifers (Gaspur and/or Artesia not present or unsaturated) EPA: SB3 to SB6	No additional exploratory boreholes to east or west as the coverage with existing/new wells is adequate. Potential deeper exploratory boring installation if deepest monitor well average COC concentration exceeds MCL or NL and existing lithologic information from original exploratory borehole not deep enough to design deeper monitor well.
	CE-3 MWA	Monitor Well	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4 (SB3 may be unsaturated)	No additional exploratory boreholes to east or west as the coverage with existing/new wells is adequate. No additional deeper monitor wells as new Hollydale monitor well in cluster provides vertical control.
	CE-3 MWB	Monitor Well	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB5	No additional exploratory boreholes to east or west as the coverage with existing/new wells is adequate. No additional deeper monitor wells as new Jefferson monitor well in cluster provides vertical control.
	CE-3 MWC	Monitor Well	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB6	No additional exploratory boreholes to east or west as the coverage with existing/new wells is adequate. Potential contingency deeper monitor well in Lynwood if average of Jefferson monitor well results for COCs exceeds MCL or NL. If deeper contingency monitor well(s) indicates concentrations of COCs exceeds MCL or NL, additional contingency deeper monitor wells may be required vertically.
Near Hawkins Well Cluster	CE-4 MWA	Monitor Well	Water table to Hollydale (100 to 140 feet)	B104: Hollydale EPA: SB4	No additional monitor wells to east or west as the coverage with existing/new wells is adequate. No additional deeper monitor wells as deeper well in Hawkins cluster provides vertical control.
Telegraph Road east side of OU2	CE-5 EB	Exploratory Borehole	Through bottom of Lynwood / EPA SB6 (350 feet, bottom of Lynwood deeper than bottom of EPA SB6)	B104: Gage (may be unsaturated); Hollydale; Jefferson and Lynwood aquifers (Gaspur not present and Artesia not unsaturated) EPA: SB3 to SB6	No additional exploratory boreholes to west as the coverage with existing/new wells is adequate, no additional investigation to east given proximity of eastern edge of OU2. Potential deeper exploratory boring installation if deepest monitor well average COC concentration exceeds MCL or NL and existing lithologic information from original exploratory borehole not deep enough to design deeper monitor well.
	CE-5 MWA	Monitor Well	Water table beneath Gage Aquifer (Gage Aquifer likely unsaturated) (100 to 120 feet)	B104: Between Gage and Hollydale (water table) EPA: SB3/SB4	No additional monitor wells to west as additional coverage with new/existing wells is adequate, no additional investigation to east given proximity of eastern edge of OU2. No additional deeper monitor wells as new Hollydale monitor well in cluster provides vertical control.
	CE-5 MWB	Monitor Well	Hollydale Aquifer: next aquifer beneath Gage (140 to 170 feet)	B104: Hollydale aquifer EPA: SB5	No additional monitor wells to west as additional coverage with new/existing wells is adequate, no additional investigation to east given proximity of eastern edge of OU2. No additional deeper monitor wells as new Jefferson monitor well in cluster provides vertical control.
	CE-5 MWC	Monitor Well	Jefferson Aquifer: next aquifer beneath Hollydale (200 to 250 feet)	B104: Jefferson aquifer EPA: SB6	No additional monitor wells to west as additional coverage with new/existing wells is adequate, no additional investigation to east given proximity of eastern edge of OU2. Potential contingency deeper monitor well in Lynwood if average of Jefferson monitor well results for COCs exceeds MCL or NL. If deeper contingency monitor well(s) indicates concentrations of COCs exceeds MCL or NL, additional contingency deeper monitor wells may be required vertically.

TABLE B-8

PRE-DESIGN INVESTIGATION EXPLORATORY BOREHOLE AND MONITOR WELL SUMMARY

LOCATION	ID	FEATURE	TARGET INTERVAL	HYDROSTRATIGRAPHIC UNITS	DECISION CRITERIA FOR ADDITIONAL INVESTIGATION
Riveria Road west of Duchess Dr	INJ-1 MWA	Monitor Well	Through bottom of Gaspur (60 to 120 feet)	B104: Gaspur EPA: SB3	No additional monitor wells in area. May add pilot injection well in vicinity of one of these monitor wells if initial hydraulic test and water quality data indicate this injection area is a potential candidate area, if this is the case the pilot injection well would be installed in the vicinity of the monitor well with the lowest hydraulic conductivity/transmissivity (INJ-1 to INJ-4). May need to evaluate contingency reinjection area if water quality data or hydraulic data do not support reinjection in this general area.
Slauson Avenue and Norwalk Avenue	INJ-2 MWA	Monitor Well	Through bottom of Gaspur (60 to 120 feet)	B104: Gaspur EPA: SB3	
Aeolian St and Westman Ave	INJ-3 MWA	Monitor Well	Through bottom of Gaspur (60 to 110 feet)	B104: Gaspur EPA: SB3	
Allport Ave and Washington Blvd	INJ-4 MWA	Monitor Well	Through bottom of Gaspur (60 to 100 feet)	B104: Gaspur EPA: SB3	
Alburtis Ave and Dunning St	CINJ-1 MWA	Monitor Well	Through bottom of Gage (100 to 170 feet)	B104: Gage EPA: SB3/SB4	Not planning on installing monitor wells in this area unless testing at INJ-1 to INJ-4 indicates that area is not suitable for injection and reinjection is not screened for further consideration. May add pilot injection well in vicinity of one of these monitor wells if initial hydraulic test and water quality data indicate this injection area is a potential candidate area, if this is the case the pilot injection well would be installed in the vicinity of the monitor well with the lowest hydraulic conductivity/transmissivity (CINJ-1 to CINJ-3). May need to evaluate alternate contingency reinjection area (not identified at this time) if water quality data or hydraulic data do not support reinjection in this general area.
Alburtis Ave and Telegraph Road	CINJ-2 MWA	Monitor Well	Through bottom of Gage (100 to 150 feet)	B104: Gage EPA: SB3/SB4	
Alburtis Ave and Pioneer Blvd	CINJ-3 MWA	Monitor Well	Through bottom of Gage (100 to 110 feet)	B104: Gage EPA: SB3/SB4	

OU2 Operable Unit 2 as defined in 2011 Record of Decision
COC Chemical of Concern
NL Notification Level
MCL Maximum Contaminant Level
EB Exploratory borehole

HARGIS + ASSOCIATES, INC.

APPENDIX B FIGURES

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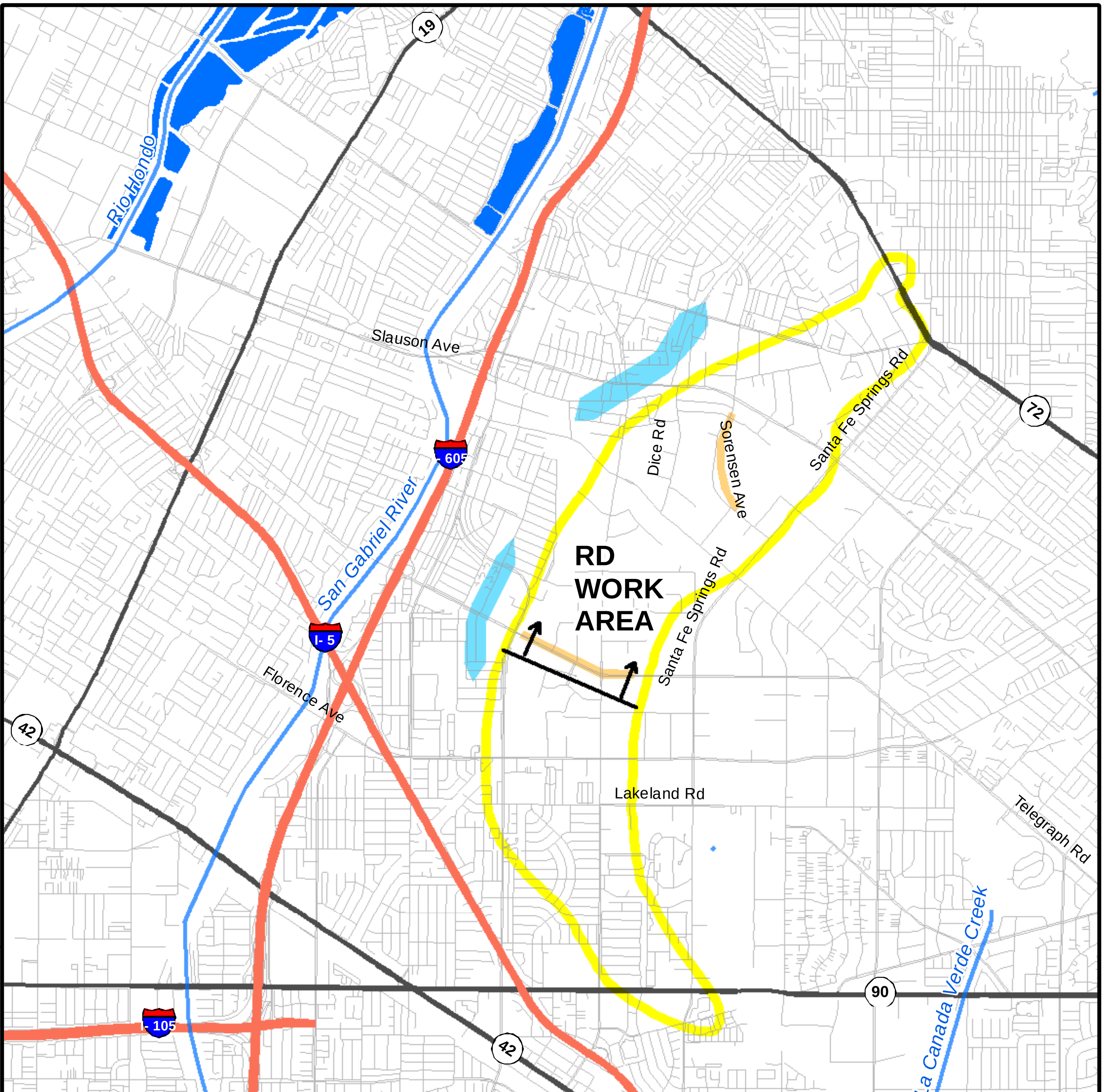

- Spreading Basin
- OU2 Boundary (2011 ROD)
- River (Lined)
- Remedial Design Work Area
- Potential Reinjection Areas
- Potential Locations of NE/CE Area Extraction Wells

NOTES:

Remedial Design Work Area (RDWA) includes Northern Extraction (NE) and Central Extraction (CE) areas. Also includes the following end uses for treated groundwater:

1) Shallow reinjection (illustrated above as potential reinjection areas)
2) Spreading basin recharge (illustrated above as spreading basin)
3) Reclaimed use (non-potable, not illustrated)
4) Deep reinjection (not illustrated)

N

0 0.25 0.5 1 1.5 2 Miles

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FIGURE B-1. REMEDIAL DESIGN WORK AREA

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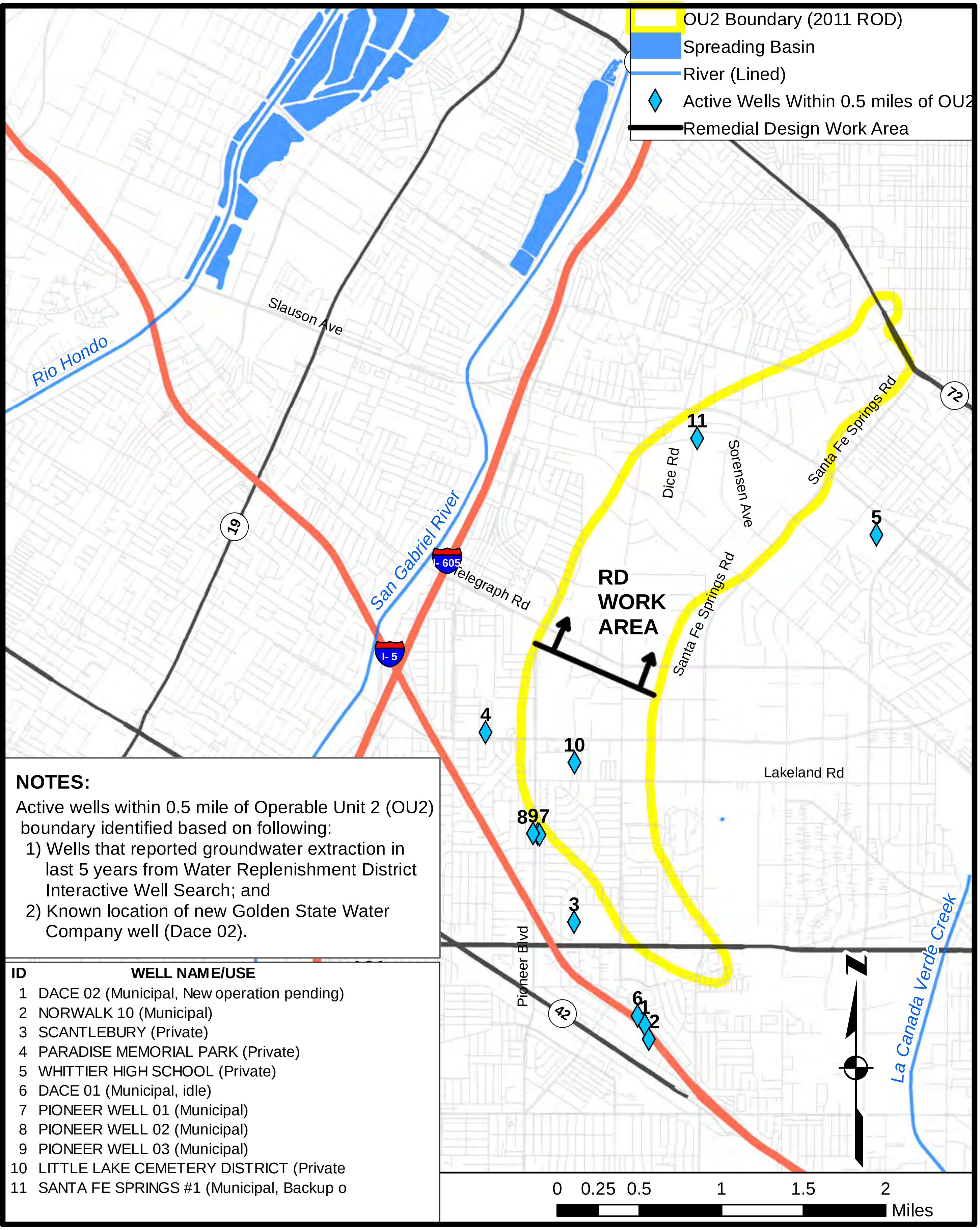

NOTES:

Active wells within 0.5 mile of Operable Unit 2 (OU2) boundary identified based on following:

1) Wells that reported groundwater extraction in last 5 years from Water Replenishment District Interactive Well Search; and
2) Known location of new Golden State Water Company well (Dace 02).

ID	WELL NAME/USE
1	DACE 02 (Municipal, New operation pending)
2	NORWALK 10 (Municipal)
3	SCANTLEBURY (Private)
4	PARADISE MEMORIAL PARK (Private)
5	WHITTIER HIGH SCHOOL (Private)
6	DACE 01 (Municipal, idle)
7	PIONEER WELL 01 (Municipal)
8	PIONEER WELL 02 (Municipal)
9	PIONEER WELL 03 (Municipal)
10	LITTLE LAKE CEMETERY DISTRICT (Private
11	SANTA FE SPRINGS #1 (Municipal, Backup o

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FIGURE B-2. ACTIVE GROUNDWATER PRODUCTION WELLS WITHIN 1/2 MILE OF OPERABLE UNIT 2

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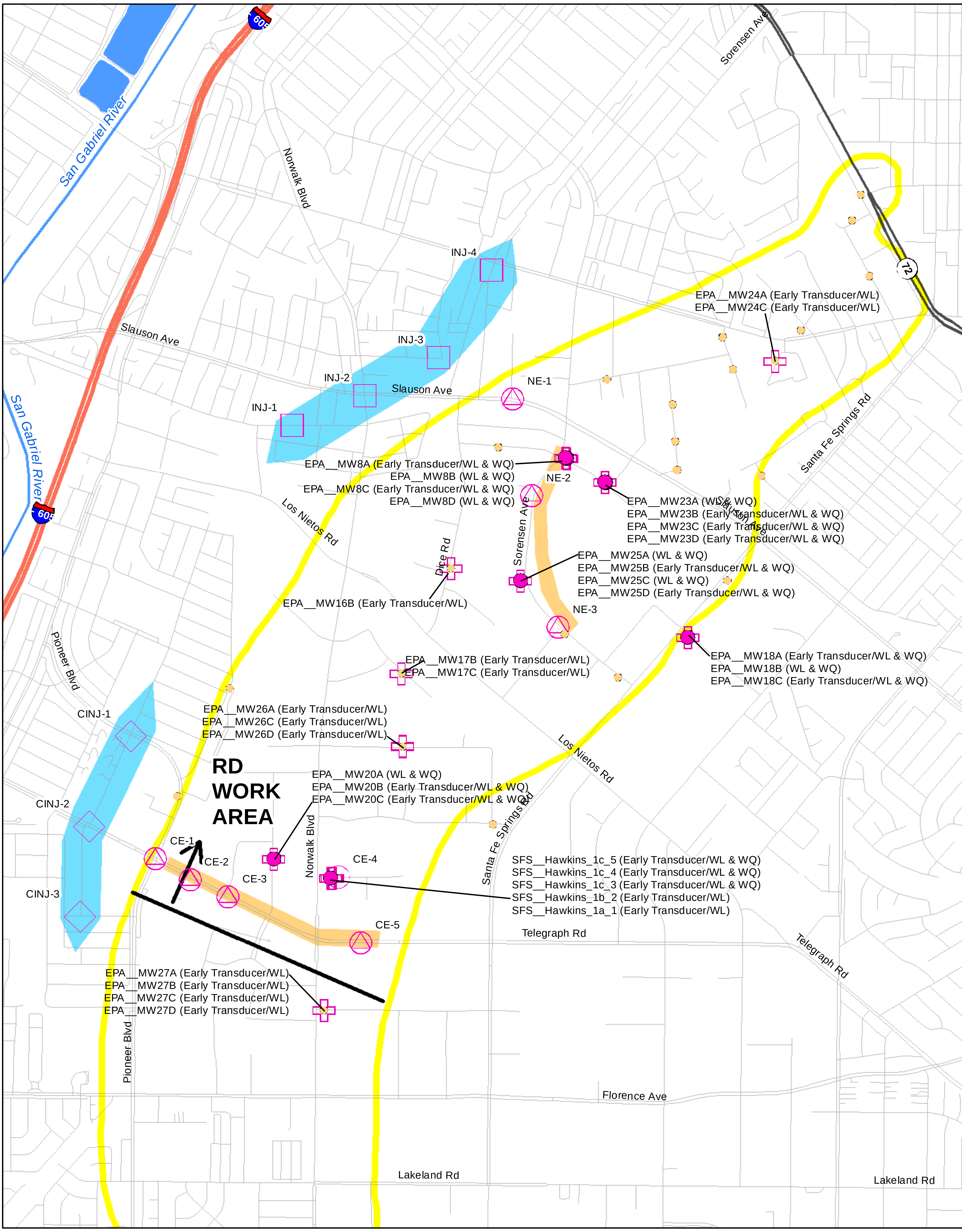

Spreading Basin
OU2 Boundary (ROD)
Remedial Design Work Area
Potential Locations of NE/CE Area Extraction Wells
Potential Reinjection Areas
PDI Early Transducer Well
PDI NE/CE EB and MW Cluster
PDI CE Shallow MW
PDI Existing Monitor Well - WQ & WL Data Collection
PDI Candidate Reinjection Shallow MW
PDI Contingency Candidate Reinjection Shallow MW
Existing Monitor Well - WL Data Collection (Not labeled)

NOTES:

Remedial Design Work Area (RDWA) is north of vicinity of Telegraph Road and includes Northern Extraction (NE) and Central Extraction (CE) areas. Also includes the following end uses for treated groundwater:

1) Shallow reinjection (illustrated above as potential reinjection areas)
2) Spreading basin recharge (partially illustrated above as spreading basin)
3) Reclaimed use (non-potable, not illustrated)
4) Deep reinjection (not illustrated)

Existing MWs are EPA or Water Replenishment District MWs in or near RD Work Area

MW = Monitor Well WL = Water Level
EB = Exploratory Borehole WQ = Water Quality
PDI = Pre-Design Investigation

N

0 750 1,500 3,000 4,500 6,000
Feet

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FIGURE B-3. SUMMARY OF PRE-DESIGN INVESTIGATION ACTIVITIES

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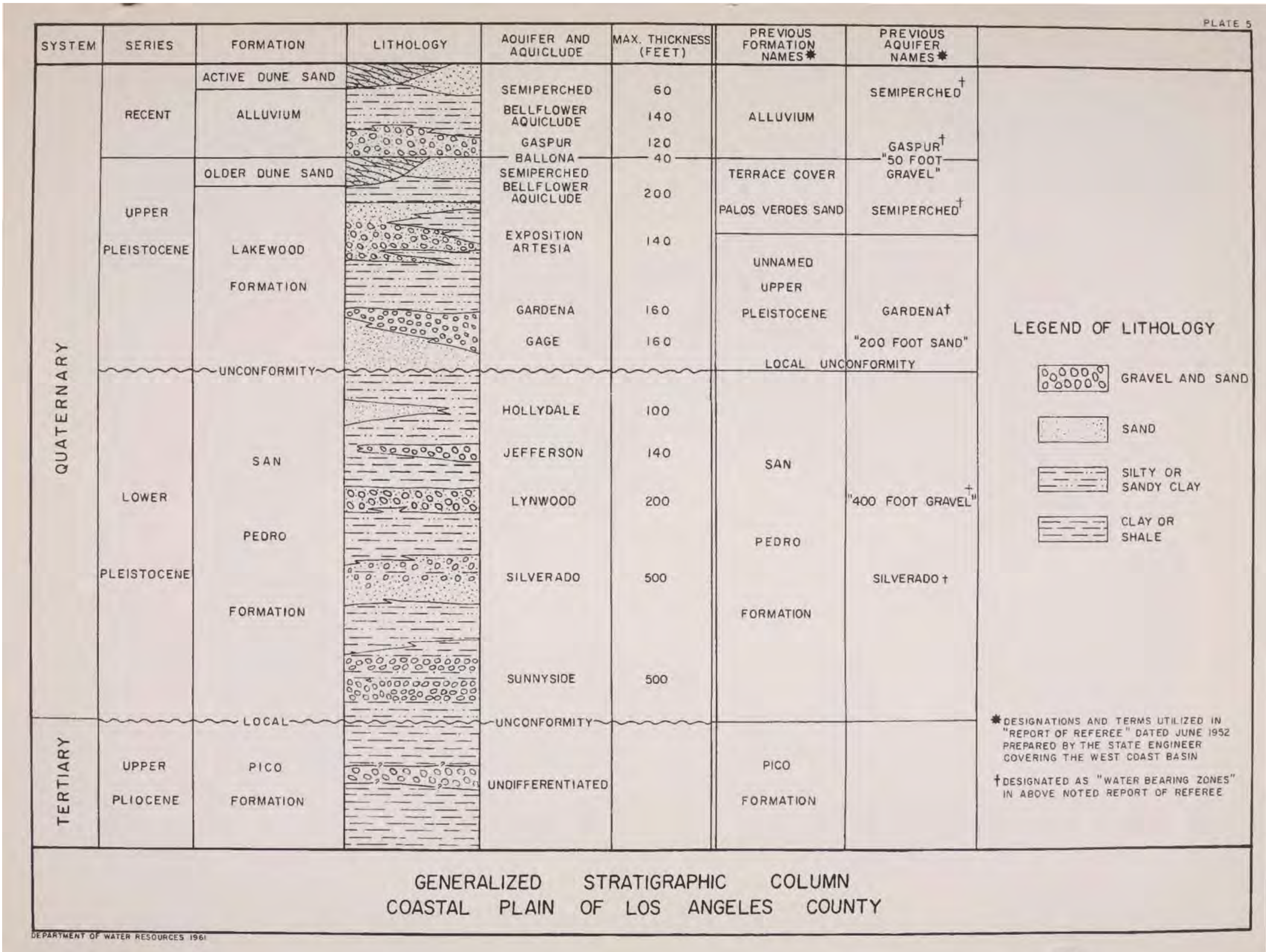

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FIGURE B-4. GENERALIZED STRATIGRAPHIC COLUMN, COASTAL PLAIN OF LOS ANGELES COUNTY